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UD TRUCKS

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BODY INSTALLATION MANUAL

UD TRUCKS

GKB 4x2 Series
CWB 6x4 Series
GWB 6x4 Series

Issued Date: May 2010

Please ensure you have the latest revision of this manual by checking the UD Trucks website: www.udtrucks.com.au

FOREWORD

This body installation manual presents the basic data and describes precautions involved in designing and manufacturing the body and general equipment to be installed on the UD Trucks forward control 4x2 GKB-Tractor series, 6x4 CWB series and 6x4 GWB-Tractor series of heavy-duty trucks.

The body manufacturer is requested to install a quality vehicle body which satisfies the customer's requirements by observing the precautions outlined in this manual.

It is the responsibility of the body manufacturer or the modification company, to make sure that the completed vehicle, with body and equipment, or after modification, confirms to all applicable laws and regulations of the State or Territory in which the vehicle is to be registered.

IMPORTANT NOTICE

- The information contained herein is based on the latest product information at the time of publication.
- The information described in this manual is general and nothing contained herein is to be regarded as authorisation by UD Trucks of the assembly or modification of any particular vehicle.
- UD Trucks is constantly working to improve its products and reserves the right to make changes in design, materials, equipment, information, specifications and models and to discontinue models or equipment at any time without prior notice.

UD Trucks
120 Hume Highway
CHULLORA NSW 2190

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LIST OF ABBREVIATIONS USED IN THIS MANUAL

ABS	Anti-Lock Braking System
ADR	Australian Design Rules
AMT	Automated Manual Transmission
AS	Australian Standard
AS/NZS	Australian Standard/New Zealand Standard
ATM	Aggregate Trailer Mass
AVSR	Australian Vehicle Standards Rules 1999
CML	Concessional Mass Limits
DITRDLG	Department of Infrastructure, Transport, Regional Development and Local Government (formerly DoTaRS)
EBS	Electronic Braking System
ECAS	Electronically Controlled Air Suspension
EHS	Easy Hill Start
Ft	Front
GCM	Gross Combination Mass
GVM	Gross Vehicle Mass
LRG	Load Restraint Guide
MSDS	Material Safety Data Sheet
PCV	Partially Completed Vehicle
PTO	Power Take Off
RHS	Rolled Hollow Section
ROF	Rear of Frame
Rr	Rear
SSM	Second-Stage-of-Manufacture
SSMM	Second-Stage-of-Manufacture, Manufacturer
UDT	UD Trucks - Australia
UDTC	UD Trucks Corporation - Japan
VIN	Vehicle Identification Number (refer to Owner's Manual for location on the vehicle)
VSB	Vehicle Standards Bulletin

MODEL CODING

This manual uses the UDTC model code designations as appear on the trucks compliance plate, vehicle identification plate, VIN (4~8th characters) and in the UDTC Service Manuals.

These UDTC model code designations vary from the general "sales model" description, as used in the Australian market.

Please refer to the following cross reference table.

Australian Market: "Sales Model" Description	**UDTC: Model Code Designation**
GK400	GKB4D
GW400	GWB4D
GW400 Long	CWB4D
GW470	GWB4D

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1) Description of Vehicle Series

Model	GKB4DADH
	(Air suspension)
Wheelbase (mm)	3530
Engine	GE13TB
Brake System	Full Air with ABS, EBS and EHS
Transmission	APR90A with ESCOT control

2) Frame

Model	GKB4DADH
	(Air suspension)
Height x Flange Width x Thickness (mm)	Main 275 x 90 x 7 Inner Reinforcement 261 x 82 x 3.2
Side Rail Assembly Width (mm)	840
Tensile Strength (MPa {kgf/mm²})	539 {55}
Yield Point (MPa {kgf/mm²})	471 {48}
Section Modulus - Max. (x 10^5mm³)	9.92

3) Tyres and Wheels

Model		GKB4DADH
		(Air suspension)
Tyre	STD	295/80R22.5 (Front/Spare), 11R22.5-16PR (Rear)
	OPT	11R22.5-16PR (All Positions)
Rim and wheel		22.5 x 8.25 offset 165mm, 10 stud (ISO)

4) Front Spring

	SPECIFICATIONS	
	Length x Width x Thickness – No. of Springs (mm)	Spring Constant (N/mm {kgf/mm})
STD	1800 x 90 x 22-1, 24-2, 14-1	292 {29.8}

5) Rear Spring

	SPECIFICATIONS	
	Type	Spring Constant (N/mm {kgf/mm})
STD	Four bag per axle, full floating NDMC air suspension with upper V link, lower torque rods, stabiliser bar and ECAS height control. RFCN: RF2058	125 {12.8} @ 500 kPa

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CWB4D 6x4 Rigid

1) Description of Vehicle Series

Model	CWB4DAW (Air suspension)
Wheelbase (mm)	6500 **CAUTION: Due to rear suspension torsional loadings the wheelbase of this model must not be shortened to less than 5500mm.**
Engine	GE13TB
Brake System	Full Air with ABS
Transmission	RTLO14913A

2) Frame

Model	CWB4DAW (Air suspension)
Height x Flange Width x Thickness (mm)	298 x 90 x 7
Side Rail Assembly Width (mm)	840
Tensile Strength (MPa {kgf/mm²})	539 {55}
Yield Point (MPa {kgf/mm²})	471 {48}
Section Modulus - Max. (x 10^5mm³)	12.19

3) Tyres and Wheels

Model		CWB4DAW (Air suspension)
Tyre	STD	11R22.5-16PR
	OPT	275/70R22.5
Rim and wheel		22.5 x 8.25 offset 165mm, 10 stud (ISO)

4) Front Spring	SPECIFICATIONS	
Vehicle Model	Length x Width x Thickness – No. of Springs (mm)	Spring Constant (N/mm {kgf/mm})
STD	1550 x 90 x 20-1, 22-2, 14-1	369 {37.6}

5) Rear Spring	SPECIFICATIONS	
	Type	Spring Constant (N/mm {kgf/mm})
STD	Four bag per axle, full floating NDMC air suspension with upper V links, lower torque rods, stabiliser bars and ECAS height control. RFCN: RF2058	125 {12.8} @ 600 kPa

Issued Date: May 2010

GWB4D 6x4 Tractor

1) Description of Vehicle Series

Model	GWB4DLHH (Trunnion suspension)		GWB4DAHH (Air suspension)	
Wheelbase (mm)	3950			
Engine	GE13TB	GE13TD	GE13TB	GE13TD
Brake System	Full Air with ABS and EBS			
Transmission	RTLO14913A	RTLO18918B or RTLO18918A-AS3	RTLO14913A	RTLO18918B or RTLO18918A-AS3

2) Frame

Model	GWB4DLHH (Trunnion suspension)	GWB4DAHH (Air suspension)
Height x Flange Width x Thickness (mm)	298 x 90 x 7	Main 298 x 90 x 7 Inner Reinforcement 284 x 75 x 4.5
Side Rail Assembly Width (mm)	840	
Tensile Strength (MPa {kgf/mm²})	539 {55}	
Yield Point (MPa {kgf/mm²})	471 {48}	
Section Modulus - Max. ($x\ 10^5 mm^3$)	18.59	14.75

3) Tyres and Wheels

Model		GWB4DLHH (Trunnion suspension)	GWB4DAHH (Air suspension)
Tyre	STD	295/80R22.5 (Front/Spare), 11R22.5-16PR (Rear)	
	OPT	11R22.5-16PR (All Positions)	
Rim and wheel		22.5 x 8.25 offset 165mm, 10 stud (ISO)	

4) Front Spring		SPECIFICATIONS	
Vehicle Model		Length x Width x Thickness – No. of Springs (mm)	Spring Constant (N/mm {kgf/mm})
GWB4D	STD	1550 x 90 x 21-1, 23-2, 19-1	429 {43.8}
	OPT	1550 x 90 x 22-1, 23-2	364 {37.1}

5) Rear Spring	SPECIFICATIONS	
Vehicle Model	Length x Width x Thickness – No. of Springs (mm)	Spring Constant (N/mm {kgf/mm})
GWB4DLHH	1300 x 90 x 20-2, 22-3, 20-3	2672 {272.5}
GWB4DAHH	HAS 460 air suspension with air dump valve RFCN: RF2022	125 {12.8} @ 600 kPa

Note: The 6th character of the vehicle model code denotes the rear suspension type;
L = Trunnion (steel leaf)
A = Air

Issued Date: May 2010

GENERAL OVERVIEW

This manual has been prepared to provide intermediate and final stage manufacturers with basic data, such as specifications and dimensions, of the chassis-cab manufactured by UD Trucks Corporation (“UDTC”). This manual is not intended to provide instructions or authorisation by UDTC for modification, alteration or completion of any vehicle and nothing contained herein is to be regarded as providing any such instructions or authorisation. UDTC and UD Trucks - Australia (“UDT”) shall not be responsible for any modification, alteration or completion of the vehicle which shall be the responsibility of subsequent Second-Stage-of-Manufacture (“SSM”) manufacturers (“SSMM”).

The chassis-cab manufactured by UDTC, and supplied by UDT, is designed to comply with all applicable Australian Design Rules (“ADR”) for a Partially Competed Vehicle (“PCV”) at the time of manufacture. ADR compliance of the chassis-cab manufactured by UDTC is granted by the Department of Infrastructure, Transport, Regional Development and Local Government (“DITRDLG”). Proof of compliance of an individual PCV is shown by UDT’s fitment of an ADR Compliance Plate.

Various regulations relating to vehicle performance, equipment, and safety have been issued by government organisations. These regulations include, but are not limited to the DITRDLG regulations. Other Federal, State, Territory and local regulations may also apply. SSMM, body builders and motor carriers are responsible for knowing and complying with all regulations that may apply to the vehicle. A finished vehicle may also require devices that are not specified in the regulations. SSMM, body builders and motor carriers must determine what safety devices are necessary for the safe operation of the vehicle. Nothing in this manual should be taken as a representation that all equipment necessary for the safe operation of the vehicle in its intended use has been installed on the partially completed chassis-cab.

All illustrations and specifications in this Body Installation Manual are based on the latest information and believed to be correct at the time of publication. The numerical values used herein are for standard specifications and dimensions. Occasionally, vehicle assembly tolerances may produce some variance in the actual vehicle.

UDTC and UDT reserve the right to make changes in design, materials, equipment, information, specifications and models and to discontinue models or equipment at any time without notice and without incurring any obligation.

Additional copies of the latest revision of this manual may be obtained from the UDT website:
www.udtrucks.com.au

AUSTRALIAN DESIGN RULES (ADR) CERTIFICATION

VEHICLE MANUFACTURER

In accordance with the Motor Vehicle Standards Act 1989, it is the responsibility of UDTC to ensure vehicles supplied by UDT in chassis-cab (i.e. PCV) configuration conform to the conditions specified in the Compliance Plate Approvals issued by the DITRDLG.

ADR Circular 0-4-11, Certification of Chassis-Cab Vehicles, clause 4.1 permits the vehicle manufacturer to supply a *PCV* in the nature of a *chassis-cab* that may not fully comply with certain ADR's, as follows.

4.1.1 The "Position" requirements of ADR 13/00 for the following Lighting and Light Signalling devices:-

- Reversing Lamp (ADR 1/00) – as per ADR 13/00 Appendix A clause 6.4.4
- Rear Direction Indicators (ADR 6/00) – as per ADR 13/00 Appendix A clause 6.5.4
- Rear Reflex Reflectors (ADR 47/00) – as per ADR 13/00 Appendix A clause 6.14.4
- Devices for Illumination of Rear Registration Plates (ADR 48/00) – as per ADR 13/00 Appendix A clause 6.8.4
- Rear Position (Side Lamps) (ADR 49/00) – as per ADR 13/00 Appendix A clause 6.10.4
- Stop Lamps (ADR 49/00) – as per ADR 13/00 Appendix A clause 6.7.4

4.1.2 Wheel Guards (Mudguards) for the rearmost wheels as per ADR 42/04 clause 14.2

4.1.3 Provision for Rear Registration Plate as per ADR 61/02 clause 9.1.1.1

Link to ADR's: http://www.infrastructure.gov.au/roads/motor/design/adr_online.aspx

SECOND-STAGE-OF-MANUFACTURE (SSM)

ADR Circular 0-4-6, Certification of Vehicles Which Have Undergone a SSM, clause 3.3 states: - "The SSM IPA (Identification Plate Approval) arrangements are available to new vehicles subject to addition and/or modification, except where the nature of the addition and/or modification does not impact on the ADR certification of the first-stage vehicle, or when the impact is considered to be minor, and readily examined by the State/Territory registration authorities.

Examples of additions/modifications considered to be a State/Territory responsibility are:-

- Where the original rearward facing lamp units of a new *chassis-cab* are relocated with the adding of an otherwise non-ADR impacting goods carrying body.
- Where the original external rear vision mirrors of a new *chassis-cab* are relocated to accommodate added goods carrying bodies of variable width.
- Where additional Side-Marker lamps are added to a commercial vehicle *chassis-cab*.
- Non-ADR relevant body added to a commercial vehicle *chassis-cab*.
- A *heavy goods vehicle* wheelbase extension".

Note: Vehicle Standards Bulletin VSB 6, Heavy Vehicle Modifications, applies to modifications to heavy vehicles with a GVM greater than 4.5 tonnes, or heavy trailers with an ATM greater than 4.5 tonnes.

Link to ADR Circulars: http://rvcs.dotars.gov.au/ then select Administrator's Circulars icon in the LHS panel

VEHICLE STANDARDS BULLETIN No.6 ("VSB 6") – HEAVY VEHICLE MODIFICATION

VSB 6 is a National Code of Practice and applies to modifications to heavy vehicles both prior to their first sale in Australia (new vehicles) and after their first sale in Australia (vehicles in service).

Although it provides detailed requirements and examples of acceptable practice for a range of common modifications, we draw your attention to Section A clause 4.4, Precedence of ADR's and Manufacturer's Guidelines, that states:- **"It is important to note that the requirements of the ADR's and the original manufacturer's modification guidelines take precedence over this National Code of Practice. Person's modifying or certifying modifications to heavy vehicles must ensure that all applicable manufacturer's recommendations are complied with and that no ADR compliance is invalidated, even as an unintended result of complying with this Code of Practice".**

Link to VSB 6: http://www.infrastructure.gov.au/roads/vehicle_regulation/bulletin/vsb_06.aspx

MANUFACTURER'S GUIDELINES

WEIGHT DISTRIBUTION CALCULATIONS

It is recommended that:

- Wheelbase, rear overhang, body length and weight distribution should take into account the intended vehicle application and operating load conditions (i.e. from unladen to fully laden to unladen) of the vehicle.
- The effect of diminishing loads should also be taken into consideration.
- The axle load conditions detailed in the Load Restraint Guide are complied with.
- In the absence of known load and operating conditions, as an alternative, the above may be determined using water level load conditions.
- The vehicle must always be operated within the lesser of:
  a) The statutory legal load limits, or,
  b) The manufacturers GVM, GCM and axle load ratings.

MAXIMUM AGGREGATE TRAILER MASS ("ATM") – Rigid Truck with Trailer

1) The rigid truck and trailer combination must always be operated within the manufacturers plated GCM.
2) The combination must always be operated in accordance with the relevant State/Territory legislation with respect to towing limits. Always check with the appropriate authority to ensure local requirements are met.
3) In the absence of any State/Territory legislation it is recommended that the maximum ATM shall be the lesser of:-
   a) The GVM, or,
   b) 50% of the GCM, or,
   c) The maximum rated capacity of the towbar.

Note: Any towbar or tow coupling fitted must conform to all the requirements of ADR 62/--, Mechanical Connections Between Vehicles. This is the responsibility of the SSMM, body builder or dealer.

UDTC SERVICE MANUAL (CWB, GKB & GWB Series)

Part No: SMCRG300E7
Source: Can be purchased from a UD Trucks dealer.

UDT SERVICE MANUAL SUPPLEMENT (Autoshift)

Part No: AUS000183
Source: Can be purchased from a UD Trucks dealer.

OTHER LEGISLATION

AUSTRALIAN VEHICLE STANDARDS RULES 1999 ("AVSR")

- The AVSR's set standards that vehicles must comply with to be driven on roads and road-related areas.
- The ADR's are rules for designing and building vehicles. Imported vehicles must also comply with the ADR's.
- The AVSR's require a vehicle that is subject to an ADR when built or imported to continue to comply with that ADR.
- The AVSR's also apply certain other standards (adopted standards) that are intended to complement the ADR's.
- **The AVSR does not apply to a vehicle if:**
  a) the provision is inconsistent with the requirements of an ADR; and
  b) the vehicle complies with the ADR requirement.

Web Site: http://www.ntc.gov.au/ then Safety & Compliance/AVSR/Model Law/AVSR (pdf file), or,
http://www.ntc.gov.au/filemedia/Reforms/AVSRConsolidated22August2007.pdf

LOAD RESTRAINT GUIDE ("LRG")

- The LRG provides transport drivers, operators, and other participants in the transport chain such as freight consignors, as well as vehicle and equipment manufacturers and suppliers with basic safety principles which should be followed for the safe carriage of loads on road vehicles.

Note: The listed items in the LRG are required to be consulted when SSMM, body builders and dealers are specifying vehicles and their associated body installation and equipment.

Part 1 SECTION B ARRANGING LOADS ON VEHICLES
1. Selecting the Vehicle
2. Positioning the Load

Part 2 SECTION G VEHICLE STRUCTURES
13. Load Distribution

Web Site: http://www.ntc.gov.au/ then Safety & Compliance/LRG, or,
http://www.ntc.gov.au/viewPage.aspx?page=A022085093006200200

CONCESSIONAL MASS LIMITS ("CML")

- CML's provide mass benefits for operators accredited under the National Heavy Vehicle Accreditation Scheme (HHVAS) Mass Management module from 1-Jul-06.

Web Site: http://www.ntc.gov.au/ then Transport Efficiency & Supply Chain Review/CML, or,
http://www.ntc.gov.au/Viewpage.aspx?page=A023144004002800200

STATE/TERRITORY Registration Authorities

Web Sites:

QLD	http://www.transport.qld.gov.au/
NSW	http://www.rta.nsw.gov.au/
ACT	http://www.rego.act.gov.au/
VIC	http://www.vicroads.vic.gov.au/Home
TAS	http://www.transport.tas.gov.au/
NT	http://www.transport.nt.gov.au/
SA	http://www.transport.sa.gov.au/index.asp
WA	http://www.dpi.wa.gov.au/licensing/566.asp

ADR SUMMARY - Applicable to '08 M/Y

	Applicable UDT Series				
	GKB4D	CWB4D	GWB4D 400	GWB4D 470	
	ADR Category				
ADR	**NC**	**NC**	**NC**	**NC**	**ADR Title**
1/00	FC	FC	FC	FC	Reversing Lamps
3/03	FC	FC			Seats and Seat Anchorages
4/03			FC	FC	Seatbelts
4/04	FC	FC			
5/04			FC	FC	Anchorages for Seatbelts
5/05	FC	FC			
6/00	FC	FC	FC	FC	Direction Indicators
8/01	FC	FC	FC	FC	Safety Glazing Material
13/00	X	X	X	X	Installation of Lighting and Light Signalling Devices on other than L-Group Vehicles
14/02	FC	FC	FC	FC	Rear Vision Mirrors
18/03	FC	FC	FC	FC	Instrumentation
30/01	FC	FC	FC	FC	Smoke Emission Control for Diesel Engines
35/02	FC	FC	FC	FC	Commercial Vehicle Braking Systems
42/04	X	X	X	X	General Safety Requirements
43/04	X	X	X	X	Vehicle Configuration & Dimensions
45/01	n/a	n/a	n/a	n/a	Lighting & Light Signalling Devices not covered by ECE Regulations
46/00	FC	FC	FC	FC	Headlamps
47/00	FC	FC	FC	FC	Retroreflectors
48/00	FC	FC	FC	FC	Devices for Illumination of Rear Registration Plates
49/00	FC	FC	FC	FC	Front and Rear Position (Side) Lamps, Stop Lamps and End-outline Marker Lamps
50/00	FC	FC	FC	FC	Front Fog Lamps
51/00	FC	FC	FC	FC	Filament Lamps
61/02	X	X	X	X	Vehicle Marking
64/00	FC(a)			FC(a)	Heavy Goods Vehicles Designed for Use in Road Trains & B-Doubles
65/00	FC	FC	FC	FC	Maximum Road Speed Limiting for Heavy Goods Vehicles and Heavy Omnibus
80/02	FC	FC	FC	FC	Emission Control for Heavy Vehicles
83/00	FC	FC	FC	FC	External Noise

Other Legislation

	FC	FC	FC	FC	National Code of Practice: Electromagnetic Compatibility (EMC)
	FC	FC	FC(b)	FC(b)	VSB 11 Certification of Road-Friendly Suspension Systems
	FC	FC	FC	FC	ECE R29 Cab Strength Requirements

Legend
- FC Full Compliance
- n/a Not Applicable (no non ECE devices installed)
- X PCV Compliance only, refer SSM and Body Builders ADR Check List
- (a) B-Double approval only
- (b) GWB4DA (air suspension) models only

SSM AND BODY BUILDERS ADR CHECK LIST

ITEM	REQUIREMENT		COLOUR	ADR	Clause	Appendix
FRONT						
1. Main (High) Beam Headlamps	M		White	13/00		A 6.1
2. Dipped (Low) Beam Headlamps	M		White	13/00		A 6.2
3. Front Position (Side) Lamps	M	{Visibility of these lamps	White	13/00		A 6.9
4. Direction Indicator Lamps	M	{must not be restricted	Amber	13/00		A 6.5
5. Hazard Warning Signals	M	{by bull bar fitment.	Amber	13/00		A 6.6
6. End-Outline Marker Lamps	M	on vehicles over 2.1m OW.	White or Amber	13/00		A 6.13
7. Fog Lamps	O		White or Yellow	13/00		A 6.3
8. External Cabin Lamps	O	on vehicles over 2.1m OW.	Amber	13/00	7.1	
LH & RH SIDE						
1. Side Repeating Direction Indicator Lamps	M		Amber	13/00		A 6.5.3
2. Side Retro-Reflectors	MS	on vehicles over 6.0m TL.	Amber	13/00		A 6.17
3. Side Marker Lamps	MS	on vehicles over 2.1m OW and a TL over 7.5m.	Amber to Front Red to Rear	13/00	7.2	
REAR						
1. Rear Position (Side) Lamps	MP		Red	13/00		A 6.10
2. Stop Lamps	MP		Red	13/00		A 6.7
3. Rear Retro-Reflectors	MP		Red	13/00		A 6.14
4. Direction Indicator Lamps	MP		Amber	13/00		A 6.5
5. Hazard Warning Signals	MP		Amber	13/00		A 6.6
6. Reversing Lamps	MP		White	13/00		A 6.4
7. Rear Registration Plate Lamp	MP		White	13/00		A 6.8, 5.10.2
8. End-Outline Marker Lamp	MS	on vehicles over 2.1m OW except flat tray and tipper type bodies.	Red	13/00		A 6.13
9. Fog Lamps	O		Red	13/00		A 6.11
10. Rear Registration Plate Mount	MS		n/a	61/02	9.1.1.1, 3	
11. Rear Marking Plates	MS	on vehicles over 12.0t GVM.	Yellow/Red	Ref. AVSR 1999 item 119 & VSB 12		
GENERAL ITEMS						
1. Vehicle Configuration and Dimensions	M	Turning Circle		43/04	5	
	MS	TL, ROH, OH, GC and OW			6	
2. General Safety Requirements	M	Electrical Wiring, Connectors & Installations		42/04	9	
	M	Exhaust Outlets			10	
	M	External or Internal Protrusions			11	
	M	Field of View			12	
	MS	Wheel Guards (Mudguards)			14	
	M	Brake Tubing and Brake Hoses			15	
	O	Sleeper Berths			17	
	O	Television and Visual Display Units			18	
	M	Warning Devices - Audible			20	
3. Brake Air Systems	O	Trailer Brake Line: Couplings		35/02	4.1.8	
	M	Preferential Charging: When additional air operated items are fitted (i.e. air horns, trailer brake controls, PTO's etc.) air supply must be taken from the delivery (outlet) side of the air system Pressure Reduction Valve (PRV)			4.7.8, 9	
	M	Actuation Timing: Wheelbase extensions			7.12	
3. Mechanical Connections Between Vehicles	O	Towbar, Tow Coupling and Fifth Wheel design and installation requirements		62/01 up to 12/08 62/02 from 01/09		
4. Trailer Braking System	O	Design, performance and compatibility requirements		38/02 up to 12/08 38/03 from 01/09		

Note: If items marked 'M' or 'O' are either supplied or modified the SSMM or Body Builder has the responsibility for ensuring the vehicles ongoing compliance.

LEGEND
- GC Ground Clearance
- M Mandatory (PCV as supplied by UDT has full compliance)
- m Metres
- MP Mandatory (SSMM, Body Builder has responsibility for positioning)
- MS Mandatory (SSMM, Body Builder has responsibility for supply and positioning)
- O Optional
- OH Overall Height
- OW Overall Width (excluding mirrors, signalling devices and side mounted lamps)
- ROH Rear Overhang
- TL Total Length

POSITIONING of LAMPS and REFLECTORS: Supplied by UDT

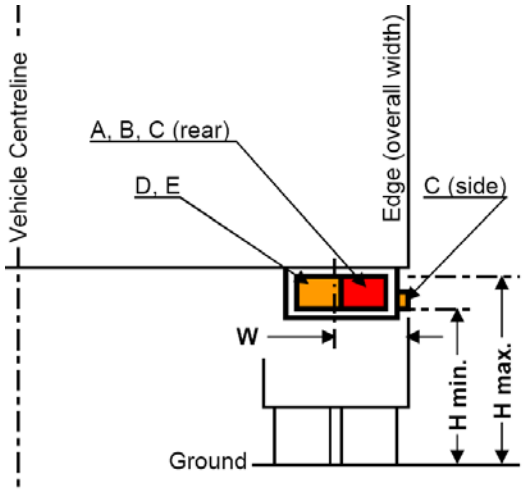
1. Rear Combination Lamp Assembly

Presence — Mandatory and includes the;
- A. Rear position lamp
- B. Stop lamp
- C. Rear and side retro-reflectors
- D. Direction indicator lamp
- E. Hazard warning signal.

Position

Width (W): The outer edge of the light-emitting surface of the indicator lamp must not be more than **400mm** from the extreme outer edge of the vehicle.

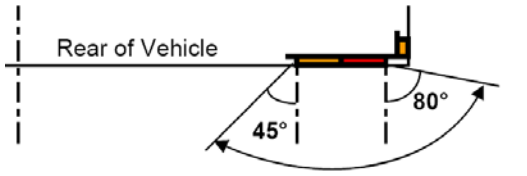
Height (H): Not less than **350mm** or more than **900mm** above the ground.
If the structure of the vehicle does not permit installation within these limits, it is permissible to increase the upper limit to not more than **1500mm**.



Rear View

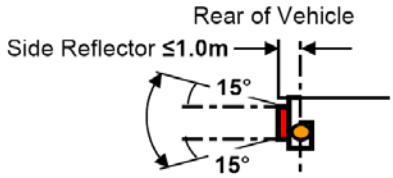
Geometric Visibility

Horizontal: **45°** inboard and **80°** outboard.



Horizontal Visibility (viewed from above)

Vertical: **15°** above and below the horizontal.



Vertical Visibility (viewed from RH side)

Note: The distance between the rearmost side retro-reflectors and the rear of the body or equipment must not exceed **1000mm**.

2 Reverse Lamp

Presence — Mandatory

Position

Width: No special requirement.

Height: Not less than **250mm** and not more than **1200mm** above the ground.

Length: At the rear of the vehicle.

Geometric Visibility

Horizontal: **45°** to the right and **45°** to the left.

Vertical: **15°** above and **5°** below the horizontal.

3 Rear Registration Plate Lamp

Presence — Mandatory and positioned so that the device illuminates the site of the registration plate.
Note: ADR 13/00, Appendix A clause 5.10.2 states:- For the visibility of white light (excludes the reverse lamp) towards the rear, there must be no direct visibility of the apparent surface of a white lamp if viewed by an observer moving within Zone 2 (height 1.0~2.2m above the ground and 15° left to right) and in a transverse plane situated 25.0m behind the vehicle.

Rear Registration Plate Position (ADR 61/02) - All N (truck) category vehicles:

9.1.1.1. provision must be made for mounting a registration plate to be affixed to the rear of the vehicle so that no part of such plate is more than **1300mm** from the ground.

9.1.1.3. no part of a vehicle, including its standard equipment, regular production options or '*Equipment'* must be so located as to obscure any part of the registration plate.

Note: State/territory regulations require a minimum geometric visibility of 45° right to left and 45° upwards.

ITEMS SUPPLIED at SSM

In accordance with ADR circular 0-4-6 and the respective regulations the supply and positioning of the following items, where required, is the responsibility of the SSMM or Body Builder.

- Additional side retro-reflectors
- Side marker lamps
- Rear end-outline marker lamps
- Rear registration plate mount
- Rear marking plates (mandatory on vehicles over 12.0t GVM).

SUB-FRAME AND BODY INSTALLATION

The rear body must be mounted to the chassis frame using a sub-frame.
Mounting of the sub-frame must conform to the following:

1. SUB-FRAME SHAPE AND MOUNTING

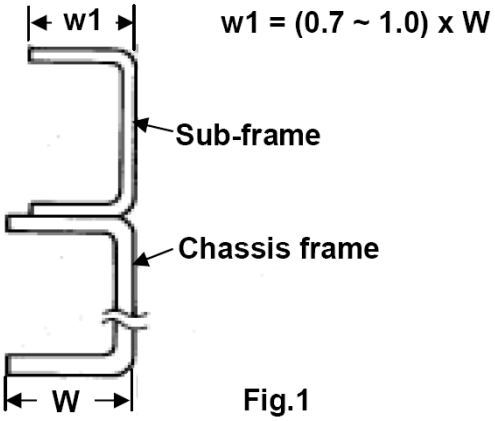
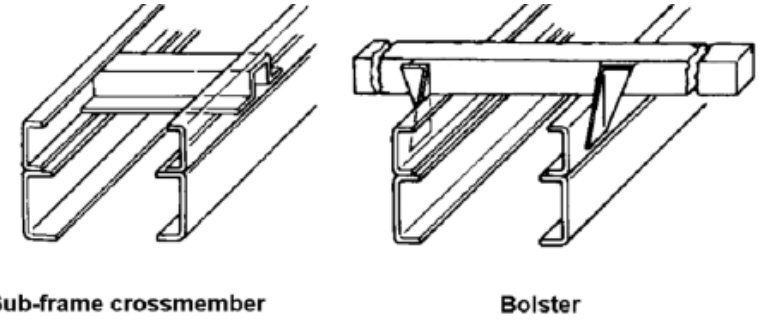


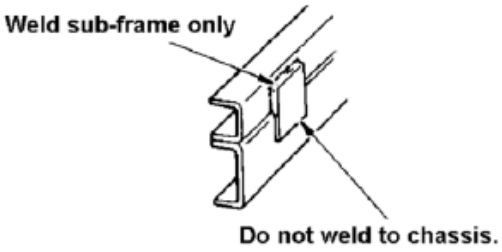
Fig.1

The sub-frame should form a continuous longitudinal channel or RHS. The width of the flange should be 70 ~ 100% of the flange width of the chassis frame (Fig.1).

Timber **should not** be used as a sub-frame due to the possibility of shrinkage and warping.



Sub-frame crossmember Bolster



Sliding stopper

Fig. 2

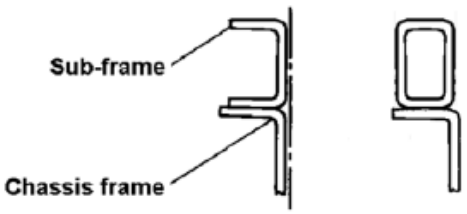


Fig. 3

(1) The lower sub-frame flange must be mounted flush with the upper flange of the chassis frame. Do not mount the sub-frame at an angle to the chassis frame. Connect the right and left sub-frame to each other by crossmembers, bolsters, or the body proper.
Sliding stoppers should be attached to the sub-frame if necessary (Fig.2).
(2) The sub-frame channel openings should face inward toward the vehicle longitudinal centreline.
(3) Align the sub-frame web surface with that of the chassis frame (Fig.3).

Issued Date: May 2010

2. FRONT-END SHAPE

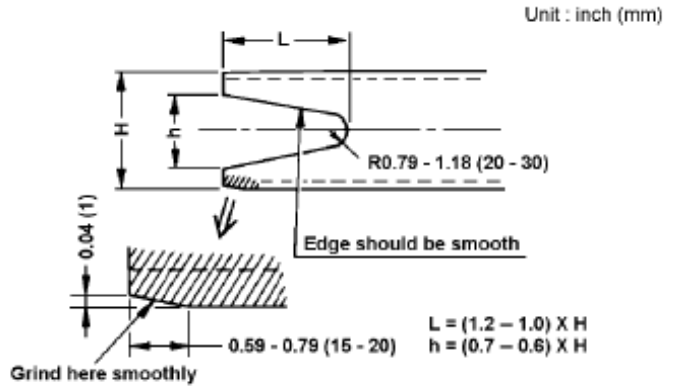


Fig. 4

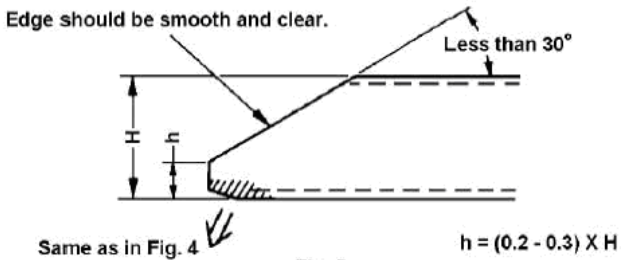


Fig. 5

The sub-frame combined with the chassis frame may have a point where the rigidity suddenly changes, increasing the possibility of stress concentration on the chassis frame. To reduce the possibility of stress concentration, shape the front end of the sub-frame so that its rigidity gradually decreases. Also extend the front end of the sub-frame as far forward as possible. See Figs. 4, 5, 6 and 7 for examples of sub-frame front-end shapes.

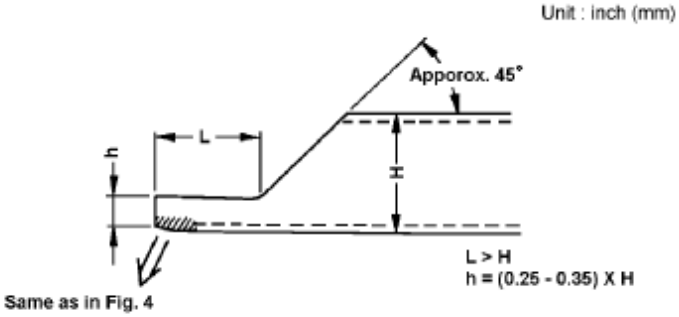


Fig. 6

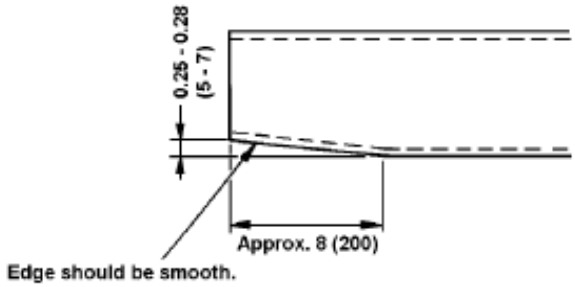


Fig. 7 (Steel sub-frame)

It is recommended that the sub-frame shown in Fig. 4, 5 or 6 be used wherever possible. If the body design or other factors preclude the use of these, Fig. 7 should be used.
When mounting a tank body or other highly rigid body, use one of the shapes in Fig. 4, 5 or 6.

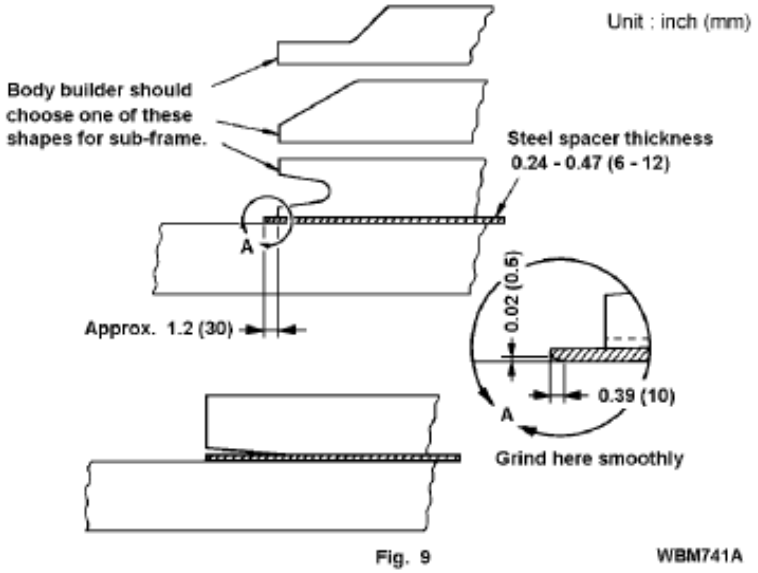
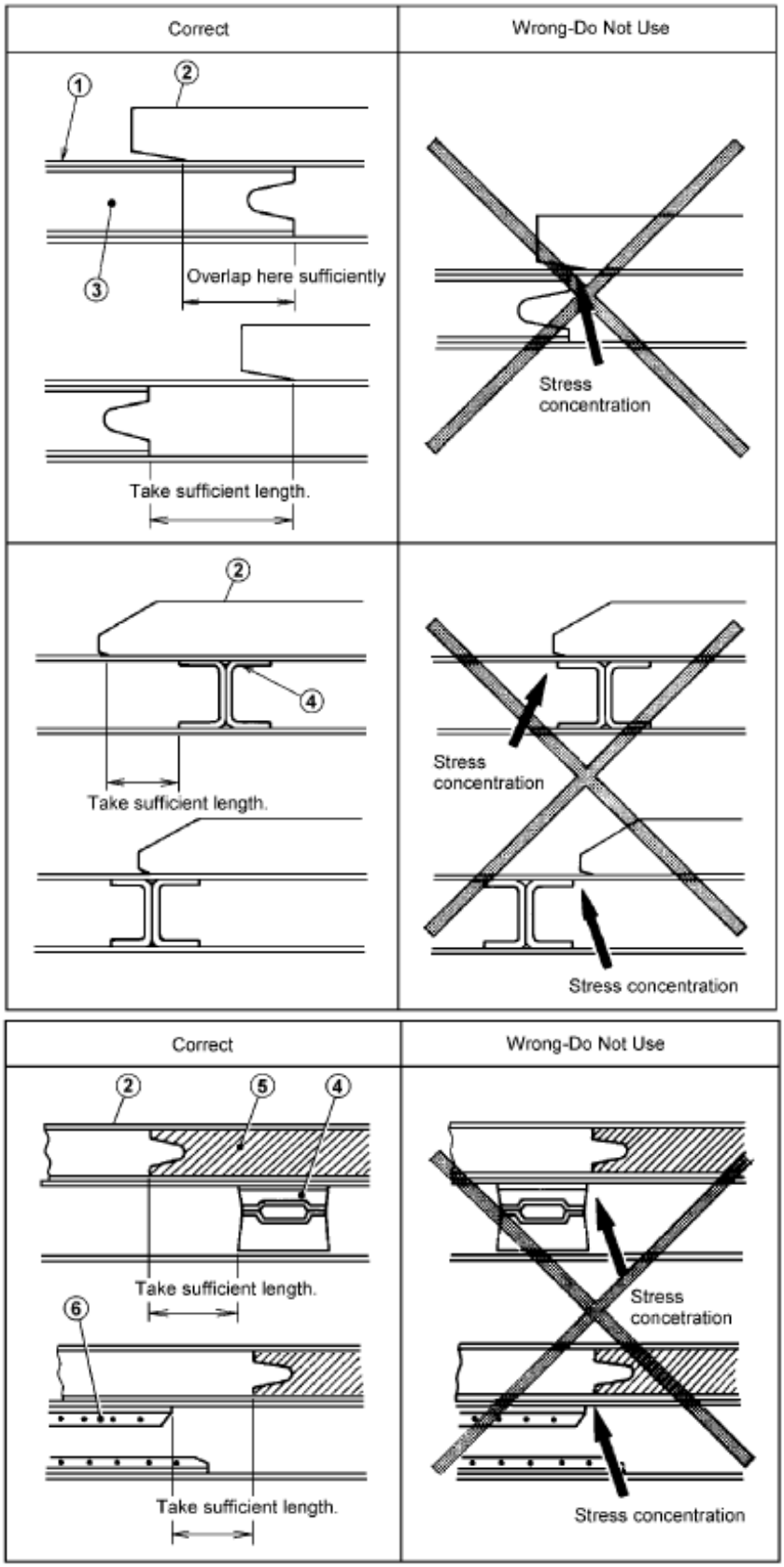


Fig. 9 WBM741A

Use a steel spacer to compensate for any uneven surface such as that caused by a gusset on the chassis frame. Avoid using semi-elastic spacer material.
When using a spacer between the frame and chassis frame, install the spacer as shown in Fig. 9.

3. POSITIONS OF FRONT- END REINFORCEMENT



① Chassis frame
② Sub-frame
③ Reinforcement (chassis frame)
④ Crossmember
⑤ Reinforcement (sub-frame)
⑥ Gusset L-shaped reinforcement

Fig. 11

The points of the chassis frame where its rigidity changes (e.g., crossmember, gusset and reinforcement) must not be located with the front end (contact point) of the sub-frame or the head and tail of any reinforcement (Fig. 11).

4. MOUNTING BRACKETS

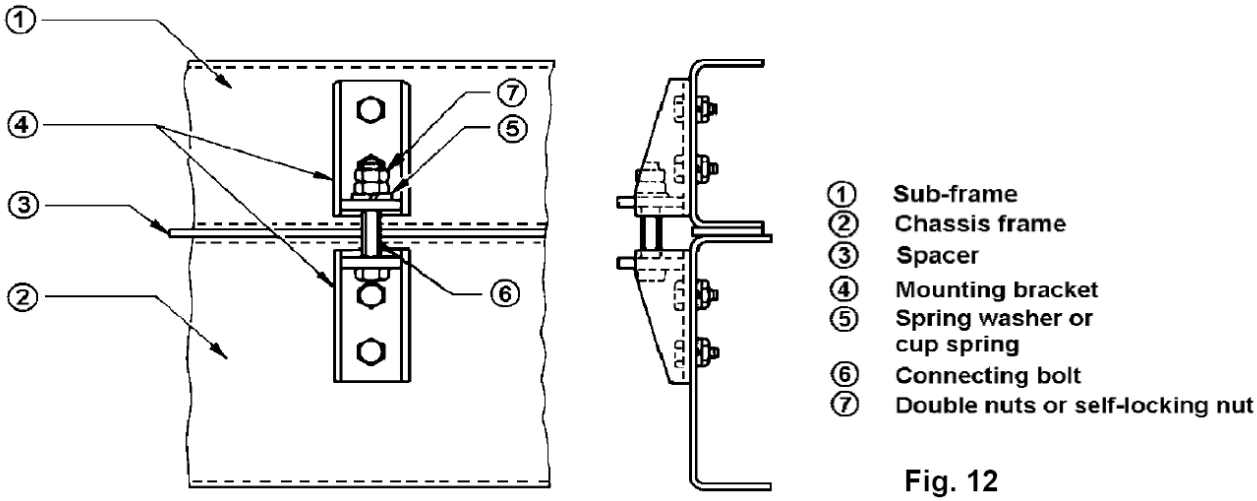


Fig. 12

The use of mounting brackets to secure the sub-frame is preferred to U-bolts. If a highly rigid body such as a tank body or closed van body is to be mounted, it is strongly recommended that spacers be used in combination with mounting brackets (Fig. 12). Sufficient spring washers should be used with the connecting bolt.
Install the mounting brackets to the chassis frame using bolt nut or rivet attachments at sufficient intervals. Do not weld.

5. LOCATION PLATES

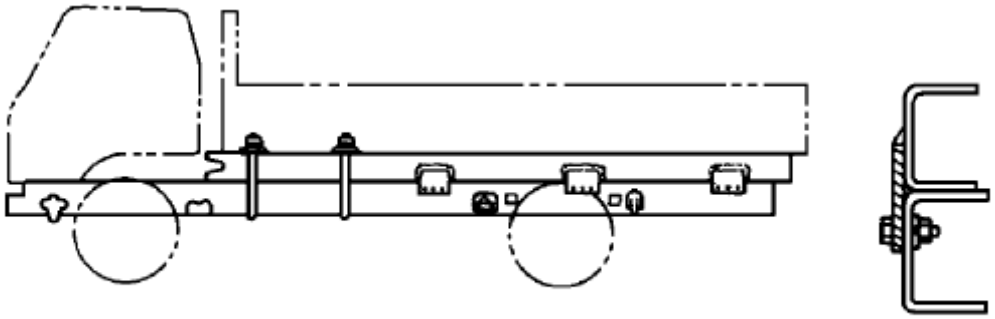


Fig. 13

WBM746A

The sub-frame cannot be securely mounted to the chassis frame using locating plates only. When employing locating plates use U-bolts or mounting brackets. Closely align the front of the sub-frame with the chassis frame using the U-bolts or mounting brackets (Fig. 12). Do not use locating plates for mounting a body having a high centre of gravity or concentrated load. Never use a locating plate for sub-frame mounting of a tank body, dump body, concrete mixer body, van body, etc. Locating plates are not recommended for vehicles operating on rough or winding roads.

6. COMBINATION WITH CHASSIS FRAME

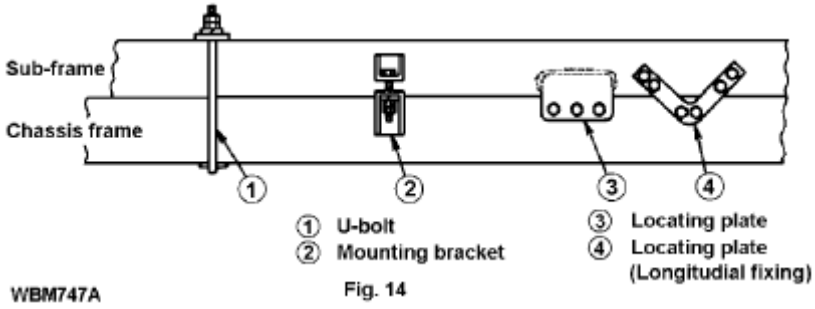


Fig. 14

To be effective, the sub-frame must be securely attached to the chassis frame. “U-Bolts”, “mounting brackets”, “locating plates”, etc. are normally used to connect the sub-frame to the chassis frame (Fig. 14). Never affix flanges directly to each other by welding or by bolt-nut attachment.

(1) “U-Bolt” Mounting

A simple method that is frequently used for attaching the body is U-bolts. This is not a recommended method for body mounting because:

- The load is carried on the top flange, not the web.
- The runner stiffens the frame thus reducing the flexibility along part of the frame length.
- The U-bolts holding the runners are often over tightened causing the frame flange to buckle. Once buckled, the flanges have their strength greatly reduced.
- When the metal spacers are positioned between the top and bottom flanges to stop the flange buckling, local stiffening occurs with resultant loss of flexibility.
- Fixing of the body relies on friction and high clamping forces, with no positive location. However tight the U-bolts are when fitted, they work loose and the body is then free to slide on the frame.
- Spacer shrinkage and wear over a period of time can occur and the body mounting becomes loose. Often U-bolts are over tightened at this time to prevent recurrence and frame distortion results.

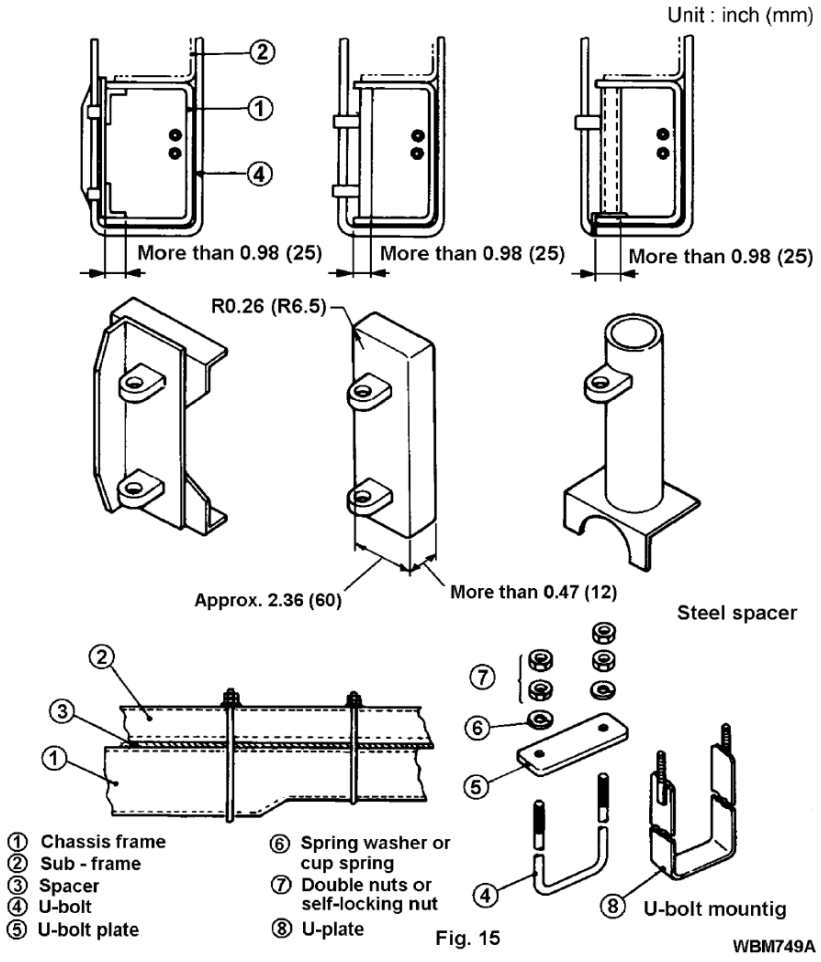


Fig. 15

If U-bolt mounting is to be used, then installation must satisfy the following conditions:

1) The frame (particularly flanges) must not be distorted. If the vehicle does not have a box type frame, metal spacers must be inserted between the top and bottom flanges of the chassis frame rail to prevent distortion when the U-bolts are tightened. The spacers should be secured in place by the U-bolts as shown in Fig. 15.
2) The body must be located fore and aft on the frame and prevented from moving during violent braking by the use of at least four (4) location plates. A location plate must be located at the front and rear of the body on both sides of the vehicle.
3) A minimum of three (3) U-bolts per side of the chassis shall be used with the maximum pitch spacing of 1750mm. Installation of U-bolts must conform to the following:
   - Lock the nuts.
   - Install the U-bolt vertically to the frame.
   - Do not install a U-bolt in a tapered portion of the frame (where the web changes in width).
4) Minimum U-bolt diameters shall be:
   - Bodies up to 2 tonne capacity – 12mm
   - Bodies over 2 tonne capacity – 16mm.
5) Class 4.6 steel U-bolts are recommended.

(2) Preventing Fore-and-Aft Movement

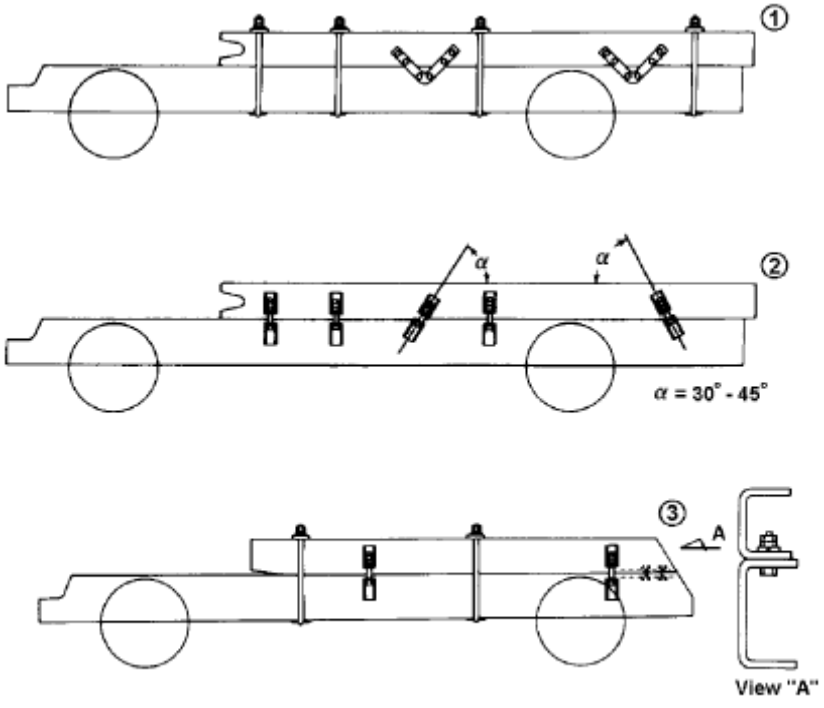


Fig. 16 WBM750A

U-bolts and vertically installed mounting brackets do not prevent fore-and-aft movement of the sub-frame. To reduce the possibility of fore-and-aft movement use locating plates as shown in Fig. 16.
The frame flanges of dump trucks having a short rear overhang, can be connected at the rear end using bolts and nuts. See Fig. 16-(3).

Note: VSB 6 section J requires, “The body must be located fore and aft on the frame and prevented from moving during violent braking by the use of at least four outrigger brackets or fishplates (i.e. location plates). A bracket or fishplate must be located at the front and rear of the body on both sides of the vehicle”.

(3) Sub-Frame Connecting Devices - Location

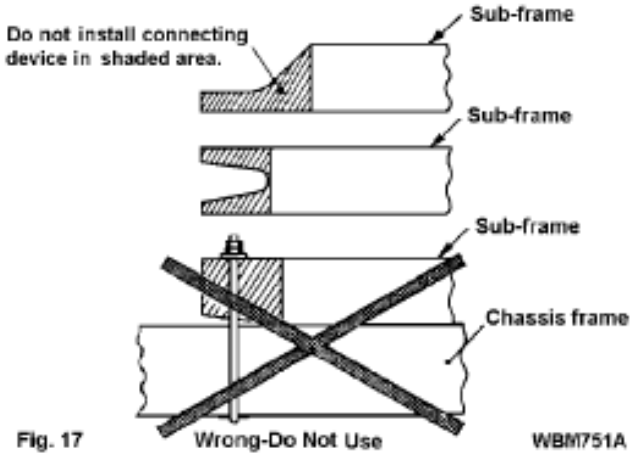


Fig. 17 Wrong-Do Not Use WBM751A

When installing sub-frame connecting devices, avoid damage to wiring harnesses, hoses, tubes, pipes, etc., which are on or near the chassis frame.
To reduce stress concentration, do not connect the chassis frame to the front of the sub-frame (Fig. 17).

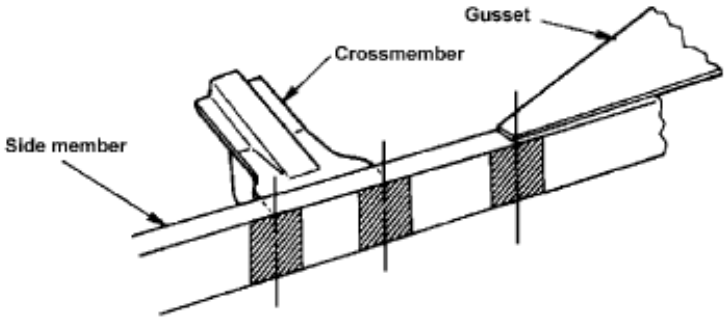


Fig. 18 WBM752A

Avoid connecting the sub-frame in shaded areas shown in Fig. 18.
When making holes and welding the chassis frame for mounting brackets and locating plates installation, follow the procedure described under the captions entitled Drilling the Frame and Riveting

7. LONG WHEELBASE TRUCK

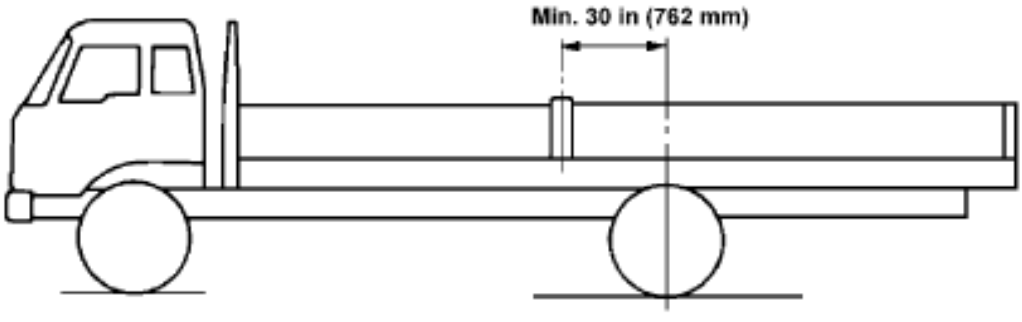


Fig. 19 WBM753A

A highly rigid sub-frame should be used on long wheelbase trucks to avoid deflection. Channel steel, lip channel steel and RHS can be utilized. DO not use a wooden sub-frame.
When a side gate centre pillar is installed on a drop side gate body, the pillar should be located ahead of the centre of the rear wheels, by at least 760mm to prevent rear overhang deflection (Fig.19).

CHASSIS FRAME

When drilling the chassis frame to mount a rear body or special equipment, the following precautions must be taken to avoid serious damage to the vehicle or reducing frame strength. Mounting should not cause stress concentration in the frame such as may occur from improper location, size or finishing of holes or by improper riveting.

1. DRILLING THE FRAME

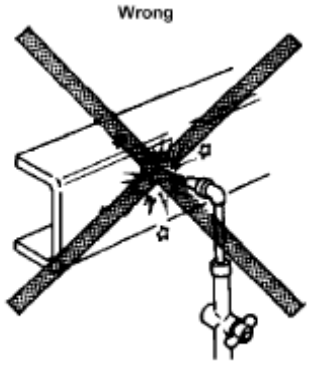


Fig. 20 WBM754A

When drilling the frame, use an ordinary twist drill. Do not use a torch (Fig. 20).

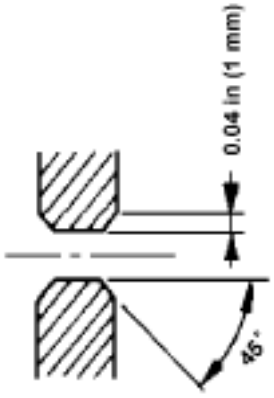


Fig. 21

All holes must be finished after drilling to help reducing the possibility of stress concentration. Chamfer all holes for fitted bolts on both bolt head and nut faces (Fig. 21).

Fig.22a

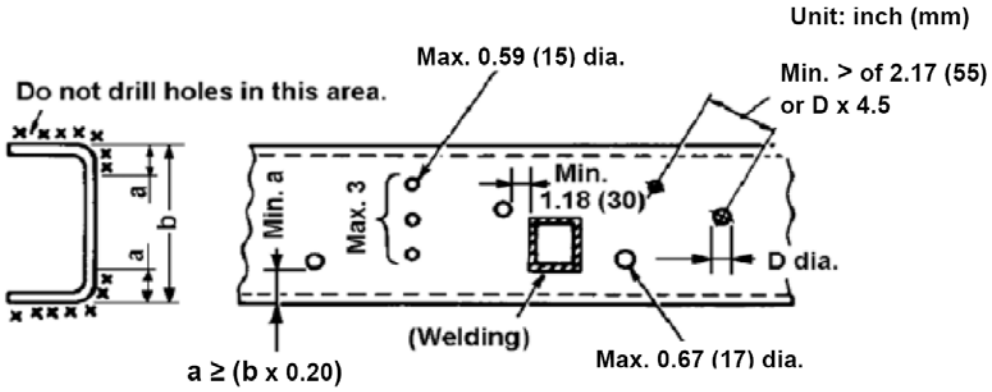


Fig.22b

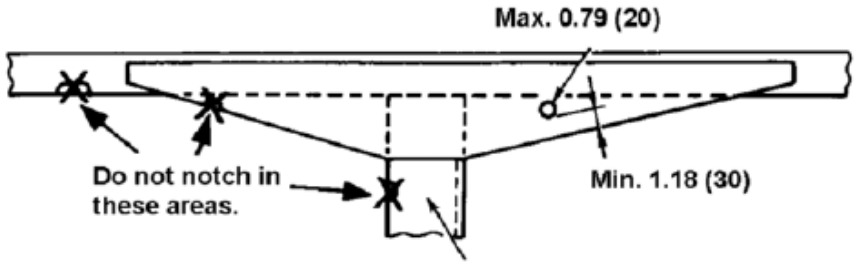


Fig.22c

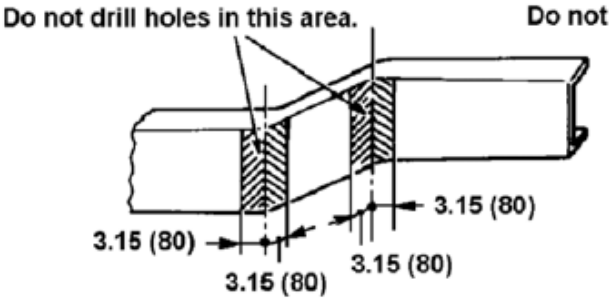


Fig.22d

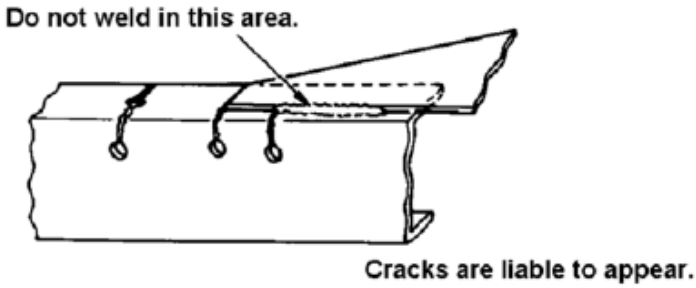


Fig. 22 WBM128A

Observe the following precautions in drilling holes. Refer to (Fig. 22):

1) Do not notch the upper and lower flanges of the side rail, gusset, and crossmember – Fig. 22 (b).
2) Do not drill holes in crossmembers – Fig. 22 (b).
3) Do not drill holes in the upper and lower flanges of the side rails except,
   (a) holes to install the end crossmember and
   (b) holes near the frame end to install bolts to reduce fore-and-aft movement of the sub-frame.
4) Do not drill holes in the upper and lower portions of the side rail web.
   In the case of a 539 MPa {55 kgf/mm²} tensile steel frame no part of the holes is to be within 20% of the frame height – Fig. 22 (a).
5) Holes must not be drilled within 80mm of the perpendicular bending lines of the side member – Fig. 22 (c).
6) The maximum hole diameter should be as follows:

Model	Max Diameter
GKB, CWB, GWB Series	17mm

7) The pitch between two hole centres should be at least 55mm or 4.5 times the diameter of the larger hole, whichever is greater. This rule should also be applied to the pitch between a new and the existing hole – Fig. 22 (a).
8) The edge of the holes should be more than 30mm from any weld.
9) No more than three holes in a series should be drilled in a vertical line. If three holes are required in a vertical line; the maximum diameter should be 15mm for GKB, CWB and GWB series heavy duty models. Avoid a series of holes in a horizontal line whenever possible – Fig. 22 (a).
10) Drill all holes perpendicular to the face to be drilled.
11) When drilling a hole in the gusset for U-bolt sub-frame mounting, the hole diameter should be 20mm or less and the distance from the edges should be more than 30mm – Fig. 22 (b).
12) Drill the holes as far as possible from existing holes in the flange, welds and the end portion of the gusset.

2. RIVETING

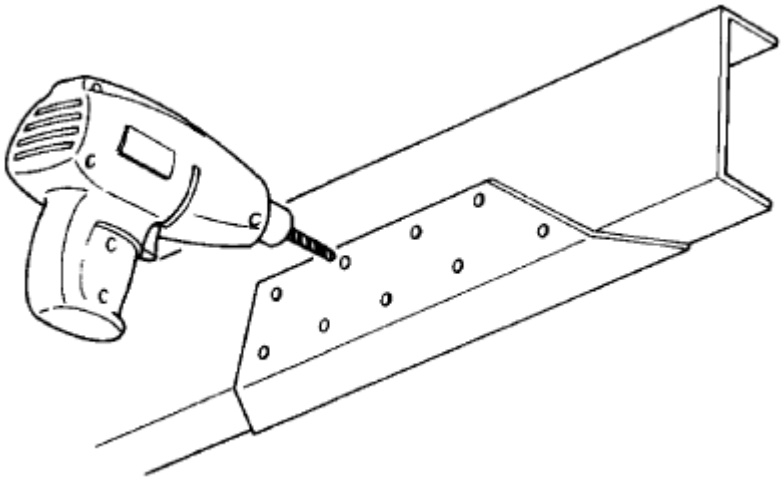


Fig. 23 WBM756A

Cold hydraulic riveting, rather than hot riveting, is strongly recommended (Scale produced during hot riveting remains on the surface or a gap is made in the rivet hole, which may cause loosening.). When hot or manual riveting is necessary, carefully inspect the finish after tightening the rivet.

Always use rivets on areas of the chassis-frame subject to shearing force. Protect rivets from direct tension. When rivets are used extensively on the vehicle frame, jointly bore the frame and parts to be installed. Rivet holes should be staggered, and not in a vertical line (Fig. 23).

MECHANICAL CONNECTIONS BETWEEN VEHICLES

1) Towbars, Tow Couplings and Fifth Wheels

The design, installation and marking must conform to the listed ADR's and their associated Australian Standards:

ADR	Title	Requirements
35/02	Commercial Vehicle Braking Systems	Section 4, clause 4.1.8 Brake Line Couplings
42/04	General Safety Requirements	Section 9, clause 9.2 Electrical Connections
62/01 62/02	Mechanical Connections Between Vehicles	Vehicles with a Compliance Date up to 12/08 Vehicles with a Compliance Date from 01/09

For installation guidelines, refer to VSB 6; section P Tow Coupling/Fifth Wheels.

Note: Effective Jan-09, the AS/NZS standards quoted in ADR 62/02 take precedence over the AS standards quoted in VSB 6.

WARNING: GKB & GWB series equipped with factory installed fifth wheel angles.
If the fifth wheel angles are removed to facilitate body/equipment installation, to ensure the ongoing integrity of the frame structure, the attaching bolts MUST be refitted and tightened to the specified tightening torque published in the UDTC Service Manual.

LIFTING DEVICES

1) Cranes

Refer to VSB 6; section Q Vehicle Mounted Lifting Systems – Slewing.

2) Tailgate/Platform Loader

Refer to VSB 6; section R Vehicle Mounted Lifting Systems – Non-Slewing.

PRECAUTIONS DURING ELECTRIC WELDING

1. Protection of Electronic Equipment

Units such as a tachograph or radio with a built in clock are directly connected to the battery, and many electronic devices that have a low resistance against high voltage are used for the controllers such as engine, ABS, EBS, EHS, and ESCOT. When performing electric welding, there is the danger that electric current from the welding machine may flow back through the grounding circuit and damage these components. Be sure to follow the procedure below when performing electric welding.

1) Turn the ignition switch to OFF.
2) Disconnect the battery (–) terminal. Be sure to insulate the removed terminal from the (+) terminal to prevent a short.
3) It is also recommended to disconnect all ECU's in the vehicle
   Engine ECU: On the engine block.
   Brake ECU: In front of the gear lever under the dash.
   Rear Axle Modulator: Adjacent to the rear axle/s mounted on the chassis.
   Transmission ECU: ESCOT behind the LH lower dash panel, AutoShift ® on the transmission.
4) Establish the grounding for the welding machine near the portion to be welded.
5) After welding, reconnect the ECU's and battery (-) terminal in the reverse sequence of removal.

2. Welding Electrode

A low hydrogen electrode conforming to either the AWS A5.1 E7016-1 H4~H8 or AS/NZS 1553.1 E4816-4 H5~H10 standard and suitable for welding the listed frame material is recommended.

GKB CWB GWB Series	SPFH540 High tension steel plate having a tensile strength of 539 MPa {55 kgf/mm²}

Typical commercially available products are the BOC Smootharc 16, Cigweld Ferrocraft 16TXP-HS, Lincoln Conarc 51 and WIA Austarc 16TC manual arc welding electrodes.

3. Welding Procedure

To be conducted in accordance with the guidelines and Australian Standards nominated in VSB 6, section H Chassis, items 5.7 General Precautions – Welding of Frame Rails, and 5.8 Welding Requirements and the following manufacturers guidelines.

(1) <u>General</u>

The chassis frames of UD Trucks are of a riveted and/or bolted construction. Therefore, avoid welding any equipment to the frame thoughtlessly. Caution should be given to a frame of high tensile steel which is easily affected by heat and may decrease in strength if improper welding is done.

Electric arc welding should be used for welding the frame and the following precautions should be exercised.

1. Do not perform tack welding to temporarily attach equipment. Cracks appear easily, and the occurrence of stress concentration is possible.
2. The welding surface should be well cleaned beforehand. Grease, paint, water, rust, dust and any other foreign matter left on the welding surface could easily make blowholes and cracks.
3. Welding slag on each layer should be completely eliminated. Slag inclusion will cause a decrease in welding strength and fatigue resistance.
4. Select an appropriate welding electrode, welding current and welding speed so that any defective welding is prevented. Some typical defects of electric arc welding are shown in the next table.
   Corrective measures to be taken are also shown for reference.

Defect	Possible Cause	Corrective Measure
Incomplete penetration	1) Inappropriate welding electrode moving speed. 2) Welding current is too low. 3) Groove angle is narrow.	Make the welding speed appropriate, and prevent slag from getting ahead of the molten pool or arc. Select the correct current for the welding condition. Enlarge the groove angle, or select an electrode diameter according to the angle.
Undercut	1) The welding electrode inclination or the electrode operating speed is inappropriate. 2) Welding current is too high. 3) Improper welding electrode.	Maintain the proper electrode angle and operation. Decrease the electrode operation speed. Decrease the weld current. Select the most appropriate electrode for the welding condition.
Slag Inclusion	1) Imperfect removal of slag from the previous layer. 2) Improper electrode operation. 3) Defective design.	Completely remove the slag from the previous layer. Increase the current a little, and operate the electrode properly. Redesign for easy welding operation.

Bead poor in appearance	1) Welding current is too high and the electrode diameter is too large. 2) Poor weld sequence, thick weld bead. 3) Electrode operation speed is improper. 4) Slag is improper in covering weld metal 5) Improper electrode is selected.	Select a current and electrode diameter according to the parent metal. Follow the proper welding sequence, operate the electrode correctly. Select an electrode operation speed enabling slag to grow from under the molten pool. Select an electrode with viscous slag. Select the most appropriate electrode for the welding condition.
Blowhole	1) Excessive current and improper electrode operation. 2) Parent metal is too thick or quickly cooled 3) Oil, paint or rust is on the welded joint. 4) The electrode is humid. 5) Material galvanised	Make the arc longer, and perform proper weaving (max. weaving is 3 times as large as the electrode core diameter). Perform proper preheating. Clean the welded joint well. Store electrodes in a dry condition and pre-condition in accordance with the manufacturers recommendations. Due to oxidising zinc, weld with an electrode using a flux of ilmenite or cellulose. For complete removal of the blowholes, remove all plating from the groove and parent metal adjacent to the weld face beforehand.
Crack	1) Parent metal contains a high degree of alloy elements such as manganese. 2) Welded joint is too rigid 3) Welding electrode is defective or humid. 4) Welding performed with excessive current or an excessively high speed. 5) Material is too thick or quickly cooled. 6) Parent metal containing too much sulphur.	Preheat, post heat and ensure a low hydrogen electrode is being used. Perform preheating and peening. Use a correct electrode, that has been stored and pre-condition in accordance with the manufacturers recommendations Perform welding at the proper current and at the proper speed. Preheat, post heat and ensure a low hydrogen electrode is being used. Use a welding electrode of low sulphur
Pit	1) Parent metal containing too much carbon and/or manganese. 2) Parent metal is too thick or quickly cooled. 3) Parent metal containing too much sulphur.	Use a welding electrode of similar alloy to parent metal. Perform preheating and post heating. Use a welding electrode of low sulphur

5. The desirable power for electric arc welding is DC electrode positive. In manual welding, by the use of the AC conformable coated electrode, AC is acceptable.
6. In order to minimise the welding residual stress, perform preheating (warm the parent metal up to approximately 100°C with a burner). It is recommended that peening with a peening hammer be performed after welding, post heating should also be used when the ambient temperature is below 20°C.

(2) Positions to be Welded – Chassis Frame

In any UD vehicle, welding should be performed as far away as possible from the positions liable to high bending moment, high bending stress, or stress concentration (e.g. crossmember end, gusset end, spring bracket, and group of holes).
Welding to any gusset or crossmember is prohibited.

1. It is strictly prohibited to weld anything to the under surface of the lower flange of the side rail within the wheelbase.

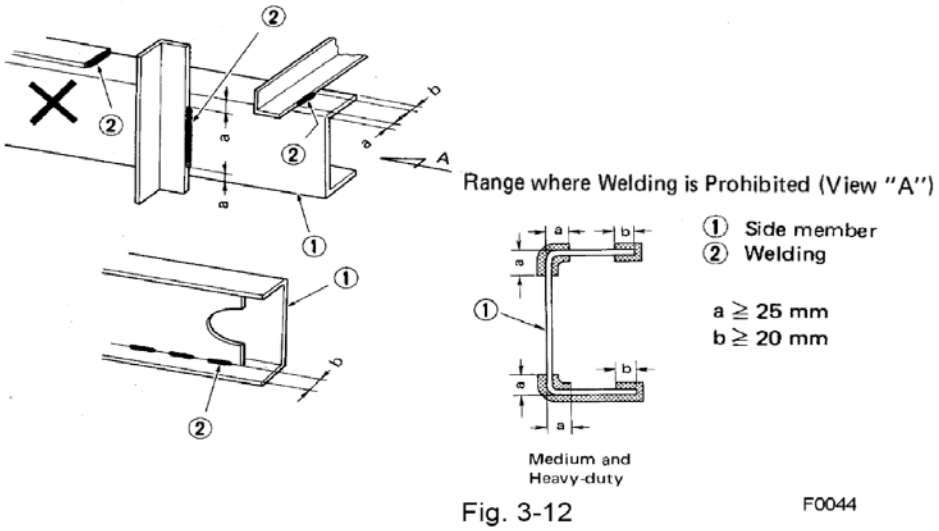


Fig. 3-12

2. In the case of steel with a high tensile strength of 539 MPa (55 kgf/mm²).
   In addition to the welding prohibition range in Fig. 3-12, welding to the outside of the upper flange is also prohibited.

3. A short weld zone is liable to harden, due to quick cooling and potentially crack. Therefore, the bead length should be at least 30mm. Defects can occur easily at the starting and ending points of welding; Thus, caution should be taken. A corner of the object to be welded must not coincide with the starting and ending points of the welding (Fig. 3-13).

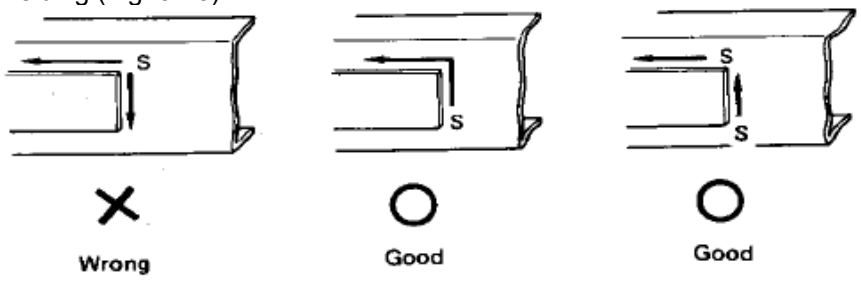


Fig. 3-13

(3.1) Extension of Chassis Frame – Rear Overhang

If the load space projects more than 1.5 the times final chassis depth and unless the body structure is self supporting at full load, extend the chassis frame. It is important to consider the weight distribution and prevent overloading the rear axle. The thickness, shape and material quality of the extension material used should be similar to that of the chassis frame.

If the extension exceeds the frame height or the extension is under concentrated load, reinforcement is necessary. The reinforcement should be similar to the frame in quality. When joining the extension material to the original frame, perform continuous butt-welding by following the procedures described below. When welding portions in an overhead position, be careful to prevent a shortage of weld penetration.

1. Groove shape
   In order to minimise thermal deformation and penetration shortage, it is recommended that an X type groove be used and that welding be performed on both the front and back sides. When a V type groove is adopted, back chipping is strongly recommended unless welding a double frame.

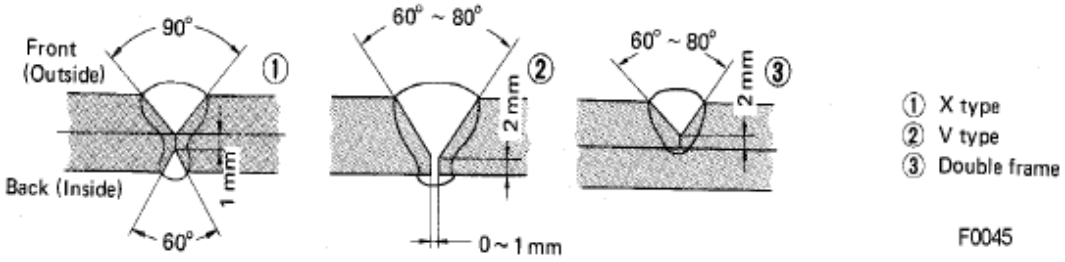


Fig. 3-14

2. Finishing
   On a butt-welded portion, provide a weld reinforcement. After completing the welding, perform the finishing work. Use a grinder to finish the welded portion smoothly in order to make it even with the parent metal and with no undercutting. Illustration below shows the area where for finishing is required.

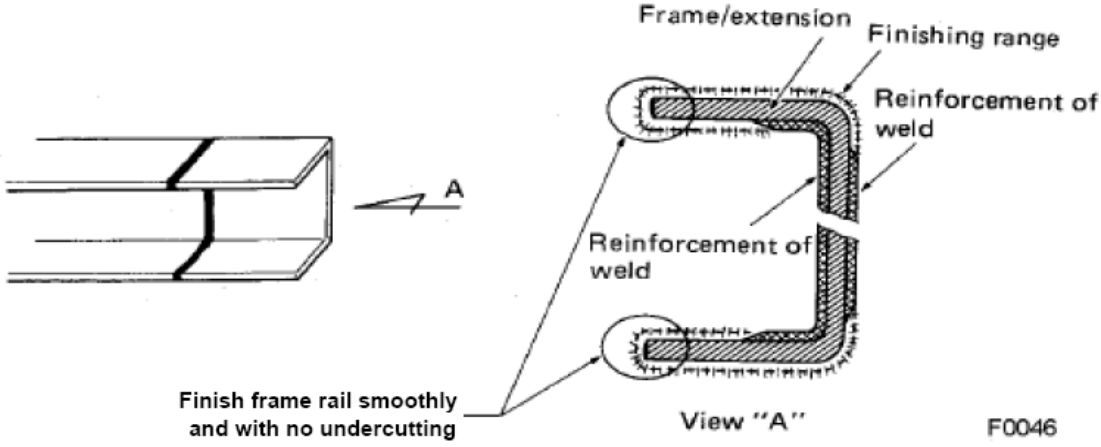


Fig. 3-15

3. When the extension amount is within the frame height (ℓ < h)
   Follow the directions given in Fig. 3-16. When a concentrated load is not applied, reinforcement is not necessary.

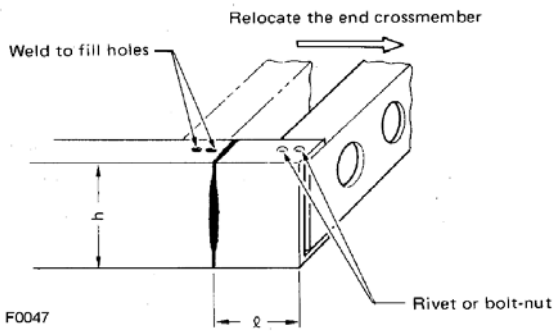


Fig. 3-16

4. Follow the directions given in Fig. 3-17 when reinforcement is required (ℓ > h)

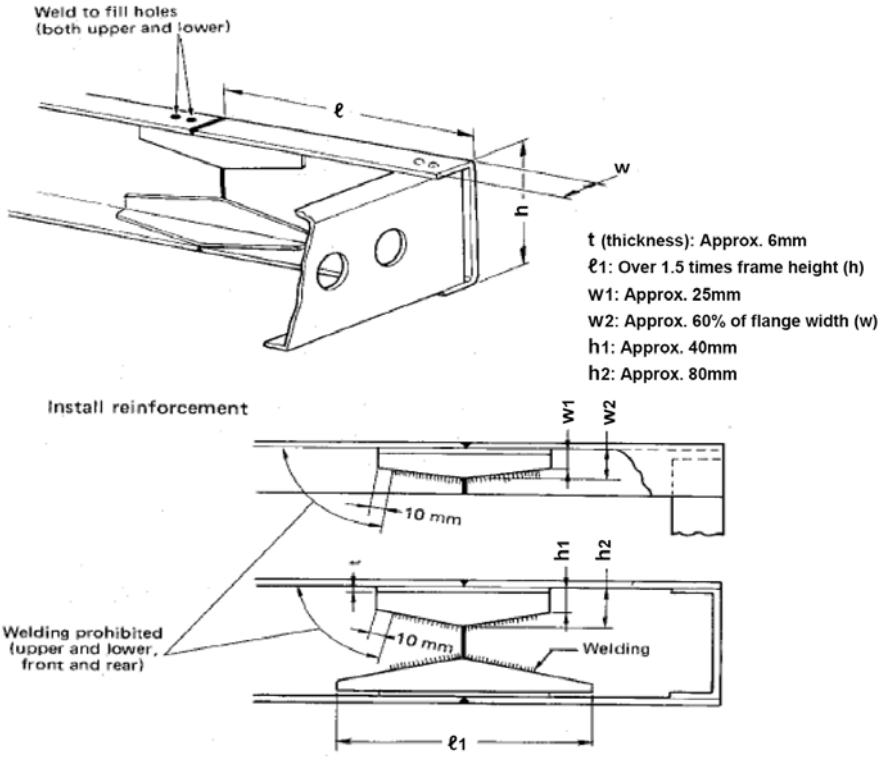


Fig. 3-17

5. With the double frame
   It is strictly prohibited to weld the inner channel and the outer channel at the same place. In providing the extension, follow the directions given in the illustration below. The inner and outer extension materials should be joined at the web by rivets or plug welds.

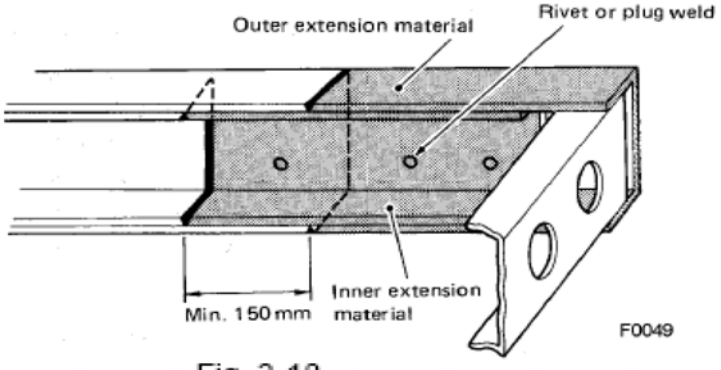


Fig. 3-18

(3.2) Cutting of the Rear Overhang

When it is inevitable, in mounting the rear body or a fifth wheel, cut the rear overhang accordingly giving consideration to weight distribution. If the frame is cut by gas, the cut portion will be extremely hot; so be careful it does not damage anything surrounding it. It is important not to leave the cut surface as it is, but finish the surface smoothly with a grinder. Be sure to install an end crossmember. For its installation, use rivets or M12 (7T) bolts and nuts tightened to the correct torque specification.

(3.3) Reinforcement of the Side Member

Generally, when installed with a sub-frame the chassis frame does not require any reinforcement. However, when mounting a specific body or meeting a specific user condition that requires reinforcement to be added to the chassis side members, follow the instructions below:

1. The standard section of the reinforcement plate should be **"L" s**haped; the thickness should be less than that of the side member but more than 40% of its thickness.
   Reinforcement using an **"]"** shaped section is capable of improving strength. However, if its installation is not precise, it may create a gap on the side member flange and cause a severe defect. Thus this type of reinforcement is not recommended.
2. For prevention of stress concentration, the end of the reinforcement plate must be cut off to less than 45° so that the section undergoes a gradual change (Fig. 3-19).

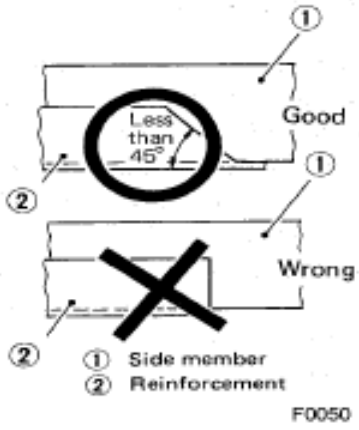


Fig. 3-19

3. Use a reinforcement material similar to the side member quality.
4. In principle, the **"L"** shaped reinforcement should be installed on the flange with tensile stress. (Within the wheelbase, the tensile side is the lower flange.)
5. The end of the reinforcement should not be aligned with any existing chassis frame rigidity changing point (end of existing reinforcing) or a concentrated load input point. In other words, the starting and ending points of the reinforcement should be sufficiently separated from, or sufficiently overlapped with, the existing reinforcement end, crossmember end, spring bracket, cab back, and sub-frame starting point, etc. (Fig. 3-20).

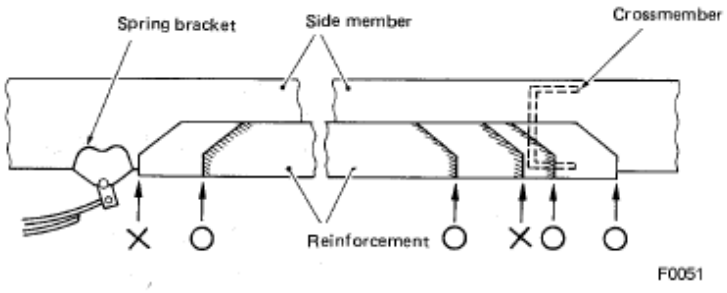


Fig. 3-20

6. The reinforcement should be desirably installed so that it is joined on the web by riveting. The standard rivet and rivet hole diameters are as follows

Model	Rivet Diameter	Rivet Hole Diameter
GKB, CWB, GWB Series	13mm	14mm

The edge distance between the rivet hole and the reinforcement plate end should be at least 25mm, and the rivet pitch should be 70 ~ 150mm.

7. When riveting is difficult, perform welding on the web surface. It is desirable to do plug welding by making holes in the reinforcement. The welding hole should be 20 ~ 30mm in diameter. The edge distance between the welding hole and the reinforcement end should be at least 25mm, and the hole pitch should be 100 ~ 170mm. If the specified pitch cannot be satisfied, fillet welding may be applied. For prevention of thermal deformation, the welding zone should be separated from a bolt hole or rivet hole as much as possible (at least 30mm).

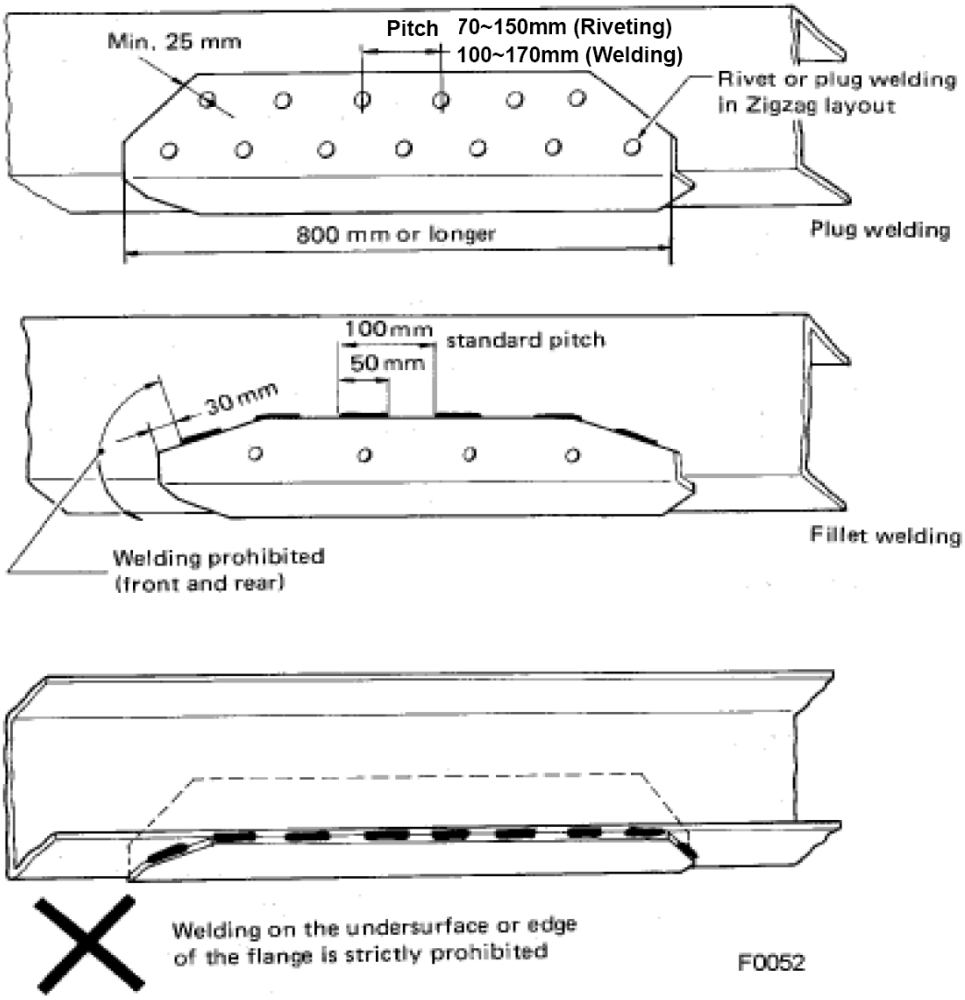


Fig. 3-21

8. Curvature of reinforcement
   Outer: The inside radius Ro (reinforcement) must be smaller than the outside radius ri (frame).
   Inner: The outside radius ro (reinforcement) must be larger than the inside radius Ri (frame).

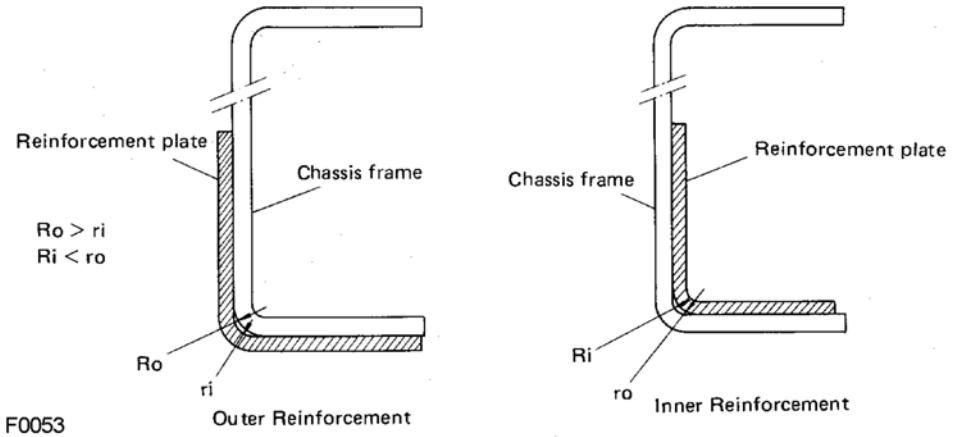


Fig. 3-22

4 Protection of Equipment During Welding

To prevent the effect of welding spatter on the equipment around the welding portion, or damage by welding heat, be sure to take the following protective measures before welding.

1) When welding in the vicinity of hoses, steel tubes, nylon tubes, harness, electrical parts, and chassis parts, cover them to protect them from welding spatters and heat.
2) Before doing welding operations in front of the engine, cover the radiator and engine to prevent damage by welding spatters and heat.
3) Before doing welding operations around the cab, cover the cab to prevent damage by welding spatters and heat.
4) Before doing welding operations around the chassis suspension, cover the suspension to protect it from welding spatters and heat.
5) When welding the outside of the frame, check for the presence, or absence of tubes inside the frame.
   If tubes exist in the frame, put an insulating shield between the frame and the tubes to block heat and weld splatter. Especially, nylon tubes as they can be easily damaged or deformed by heat.

5. Other Precautions

1) Avoid welding excessively in one area, or adjacent areas when possible (stagger weld sequence).
2) The welding length should be kept short, however not less than 30mm.
3) Be careful not to cause welding defects such as incomplete welding, undercut, slag inclusion, blowhole, and crack.

PRECAUTIONS ON VEHICLES EQUIPPED WITH ABS

The ABS is a brake control mechanism which contains electronic circuits processed by a microcomputer.
Therefore, when installing the body near ABS components or remodelling vehicles equipped with ABS, it is necessary to pay attention to the brake control equipment or electronic parts.
Especially when body installing or remodelling using electric welding, incorrect operations could adversely affect the parts or equipment. Be sure to observe the following precautions.

1. Prohibited matters
   1) Modification of the brake system component parts is prohibited.
   2) Use of tyres other than those specified is prohibited.
   3) Relocation or remodelling of the ABS unit (modulator, control unit, sensor, etc.), brake piping and ABS harness is prohibited.

   Note: Do not take power for audio system, auxiliary lights, etc. from the ABS harness.

2. Precautions for body installation
   1) When installing the following parts, keep them 100mm or more away from the modulator, control unit, sensors and ABS harness.
      - Radio wave transmitters and receivers and related antennas and harness.
      - Motors, relays, etc. which produce electrical noise.
   2) When electric welding is used at the body installation, turn the ignition switch to OFF and disconnect the ECU's and battery ground terminal.
   3) After finishing the body installation, carefully check the piping and harness for damage.
   4) Perform the normal ABS inspection. For procedures of the ABS inspection, refer to the UDTC Service Manual.

      The main procedure is as follows:
      - Check with a self diagnosis function.
      - Drive the vehicle on four/six free rollers or drive on actual roads, and apply brakes to check for the operation of ABS.
   5) Other inspections
      - If the vehicle is equipped with electrical equipment such as radio transmission devices etc. which are used during driving, perform ABS inspection while the equipment is operating.
      - If the vehicle is equipped with electrical equipment such as a tailgate lifter etc. which is used while the vehicle is at a stop, operate the equipment with the ignition switch turned ON or the engine operating and check the ABS for incorrect operation or the warning light for illumination.

PRECAUTIONS ON VEHICLES EQUIPPED WITH EBS

The EBS is a brake control mechanism which contains electronic circuits processed by a microcomputer.
Therefore, when installing the body near EBS components or remodelling vehicles equipped with EBS, it is necessary to pay attention to the brake control equipment or electronic parts.
Especially when body installing or remodelling using electric welding, incorrect operations could adversely affect the parts or equipment. Be sure to observe the following precautions.

1. Prohibited matters
   1) Modification of the brake system component parts is prohibited.
   2) Use of tyres other than those specified is prohibited.
   3) Relocation or remodelling of the EBS unit (ABS modulator, control unit, sensor, axle modulator, proportional relay valve, solenoid relay valve, etc.), brake piping and EBS harness is prohibited.
      Note: Do not take power for audio system, auxiliary lights, etc. from the EBS harness.

2. Precautions for body installation
   1) When installing the following parts, keep them 100mm or more away from the ABS modulator, control unit, sensors, axle modulator, proportional relay valve, solenoid valve and EBS harness.
      - Radio wave transmitters and receivers and related antennas and harness.
      - Motors, relays, etc. which produce electrical noise.
   2) When electric welding is used at the body installation, turn the ignition switch to OFF and disconnect the ECU's and battery ground terminal.
   3) After finishing the body installation, carefully check the piping and harness for damage.
   4) Perform the normal EBS and ABS inspection. For procedures of the EBS and ABS inspection, refer to the UDTC Service Manual.
      The main procedure is as follows:
      - Check with a self diagnosis function.
      - Drive the vehicle on four/six free rollers or drive on actual roads, and apply brakes to check for the operation of EBS and ABS.
   5) Other inspections
      - If the vehicle is equipped with electrical equipment such as radio transmission devices etc. which are used during driving, perform ABS inspection while the equipment is operating.
      - If the vehicle is equipped with electrical equipment such as a tailgate lifter which is used while the vehicle is at a stop, operate the equipment with the ignition switch turned ON or the engine operating and check the EBS for incorrect operation or the warning light for illumination.

PRECAUTIONS ON VEHICLES EQUIPPED WITH ESCOT

The ESCOT is a transmission control mechanism which contains electronic circuits processed by a microcomputer.
Therefore, when installing the body near ESCOT parts or remodelling vehicles equipped with ESCOT, it is necessary to pay attention to the transmission control equipment or electronic parts.
Especially when body installing or remodelling using electric welding, incorrect operations could adversely affect the parts or equipment. Be sure to observe the following precautions.

1. Prohibited matters
   1) Relocation or remodelling of the air tubing and electrical harness and connectors.
      Note: Do not take power for audio system, auxiliary lights, etc. from the ESCOT harness.
   2) Modification of transmission or gear shift unit.
   3) Modification of clutch, clutch booster, or clutch pedal.
   4) Use of a differential ratio or tyre size other than those specified is prohibited.

2. Precautions for body installation
   1) When electric welding is used at the body installation, turn the ignition switch to OFF and disconnect the ECU's and battery ground terminal.
   2) Some ESCOT related clutch and transmission components require periodical adjustment and maintenance. Therefore, provide adequate clearance for access and serviceability on top of and around the transmission and clutch area. Attachments (such as a tool box) in the area should be easily removed.
   3) Some ESCOT related parts require adjustment after installation. Perform an operation check of them in accordance with the UDTC Service Manual.

PRECAUTIONS ON VEHICLES EQUIPPED WITH AUTOSHIFT

Autoshift is a transmission control system which contains electronic circuits processed by a microcomputer.
Therefore, when installing the body near Autoshift parts or remodelling vehicles equipped with Autoshift, it is necessary to pay attention to the transmission control equipment or electronic parts.
Especially when body installing or remodelling using electric welding, incorrect operations could adversely affect the parts or equipment. Be sure to observe the following precautions.

1. Prohibited matters
   1) Relocation or remodelling of the air tubing and electrical harness and connectors.
      Note: Do not take power for audio system, auxiliary lights, etc. from the Autoshift harness/s.
   2) Modification of transmission or gear shift unit.
   3) Modification of clutch, clutch booster, or clutch pedal.
   4) Use of a differential ratio or tyre size other than those specified is prohibited.

2. Precautions for body installation
   1) When electric welding is used at the body installation, turn the ignition switch to OFF, ensure the Transmission is powered down, disconnect the vehicle ECU's and battery ground terminal.
   2) Some Autoshift related clutch and transmission components require periodical adjustment and maintenance. Therefore, provide adequate clearance for access and serviceability on top of and around the transmission and clutch area. Attachments (such as a tool box) in the area should be easily removed.
   3) Some Autoshift related parts require adjustment after installation. Perform an operation check of them in accordance with the UD Trucks – Autoshift Service Manual Supplement AUS000183

PRECAUTIONS ON VEHICLES EQUIPPED WITH EHS (hill start assist device)

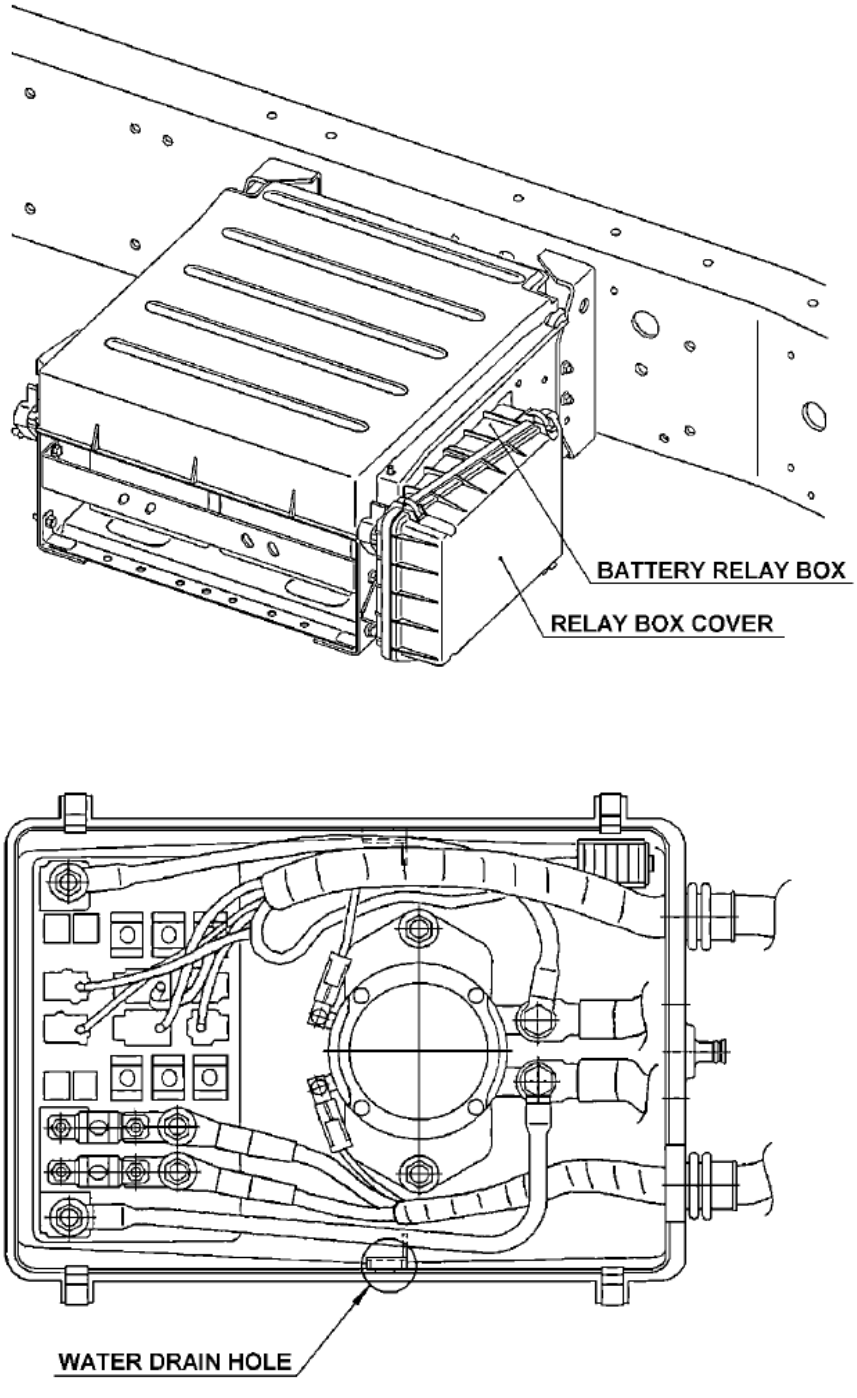
The EHS is a brake control mechanism which contains electronic circuits processed by a microcomputer.
Therefore, when installing the body near EHS components or remodelling vehicles equipped with EHS, it is necessary to pay attention to the brake control equipment or electronic parts.
Especially when body installing or remodelling using electric welding, incorrect operations could adversely affect the parts or equipment. Be sure to observe the following precautions.

1. Prohibited matters
   1) Modification of the brake system component parts is prohibited.
   2) Use of tyres other than those specified is prohibited.
   3) Relocation or remodelling of the EHS unit (EHS valve, control unit, clutch stroke sensor, clutch hydraulic pressure switch, vehicle speed sensor, etc.), brake piping and EHS harness is prohibited.
      Note: Do not take power for audio system, auxiliary lights, etc. from the EHS harness.

2. Precautions for body installation
   1) When installing the following parts, keep them 100mm or more away from the EHS valve, control unit and EHS harness.
      - Radio wave transmitters and receivers and related antennas and harness.
      - Motors, relays, etc. which produce electrical noise.
   2) When electric welding is used at the body installation, turn the ignition switch to OFF, and disconnect the ECU's and battery ground terminal.
   3) After finishing the body installation, carefully check the piping and harness for damage.
   4) Perform the normal EHS inspection. For procedures of the EHS inspection, refer to the UDTC Service Manual.
      The main procedure is as follows:
      - Check with a self diagnosis function.
      - Check the operation of EHS while driving the vehicle.
   5) Other inspections
      - If the vehicle is equipped with electrical equipment such as radio transmission devices etc. which are used during driving, perform EHS inspection while the equipment is operating.
      - If the vehicle is equipped with electrical equipment such as a tailgate lifter etc. which is used while the vehicle is at a stop, operate the equipment with the ignition switch turned ON or the engine operating and check the EHS for incorrect operation or the warning alarm for activation.

RELOCATION OF THE BATTERY OR RELAY BOX

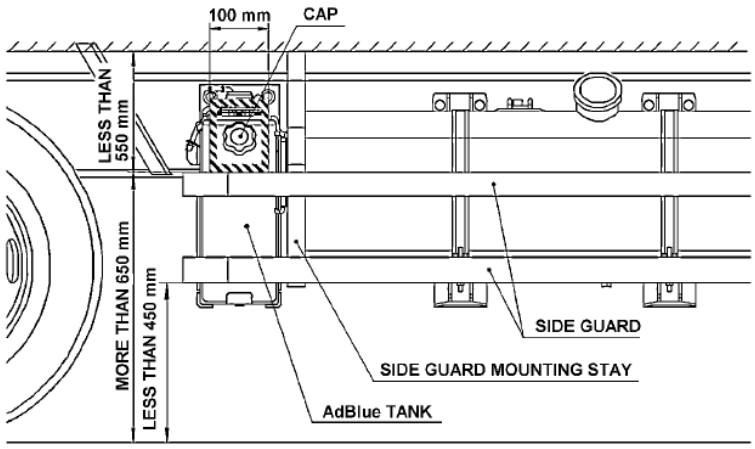
When the battery and/or relay box must be relocated during the body installation, install the battery relay box with the face having the water drain hole downside as shown in the figure below. If it is installed with the face having the water drain hole to the side, or upside, water may enter the box, causing trouble and damage to the components inside the relay box.



PRECAUTIONS FOR BODY INSTALLATION AROUND THE AdBlue® (urea water solution) TANK

1. Installation of body and/or equipment
   When installing a body and/or equipment around the AdBlue tank, be careful not to cover the AdBlue filling hole (cap) with the body and/or equipment. Provide a clearance around the cap as shown in the figure below to allow the AdBlue cap to be removed and replaced and the filling nozzle to be inserted.

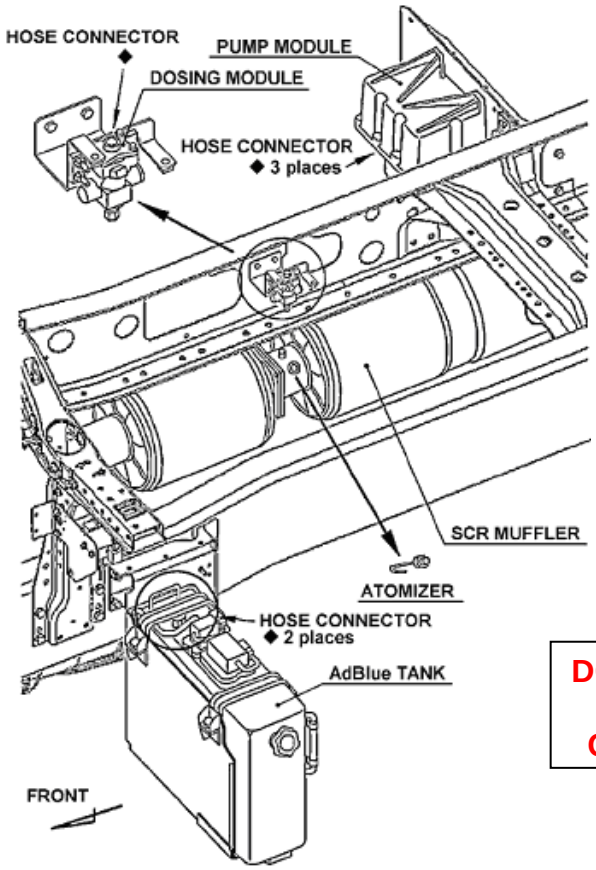
Example



Example shown Japanese model

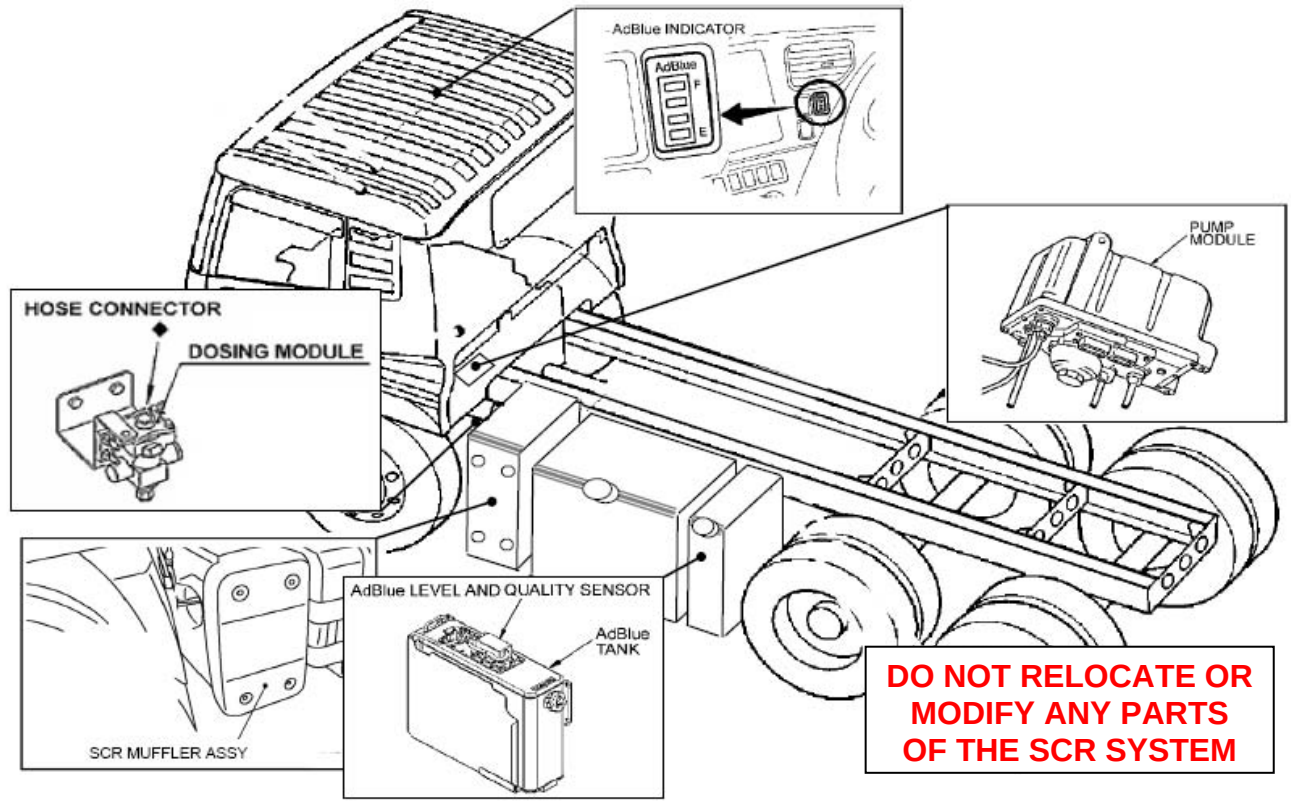
2. AdBlue tank, piping, pump module, dosing module and SCR muffler
   The AdBlue tank, piping parts, pump module, dosing module and SCR muffler are installed for the purpose of making the vehicle compliant to the emission gas regulations (ADR 80/02).
   WARNING: DO NOT relocate any parts or modify their connecting piping hoses in any way or for any reason. To do so will void the vehicles ADR emission compliance (ADR 80/02).

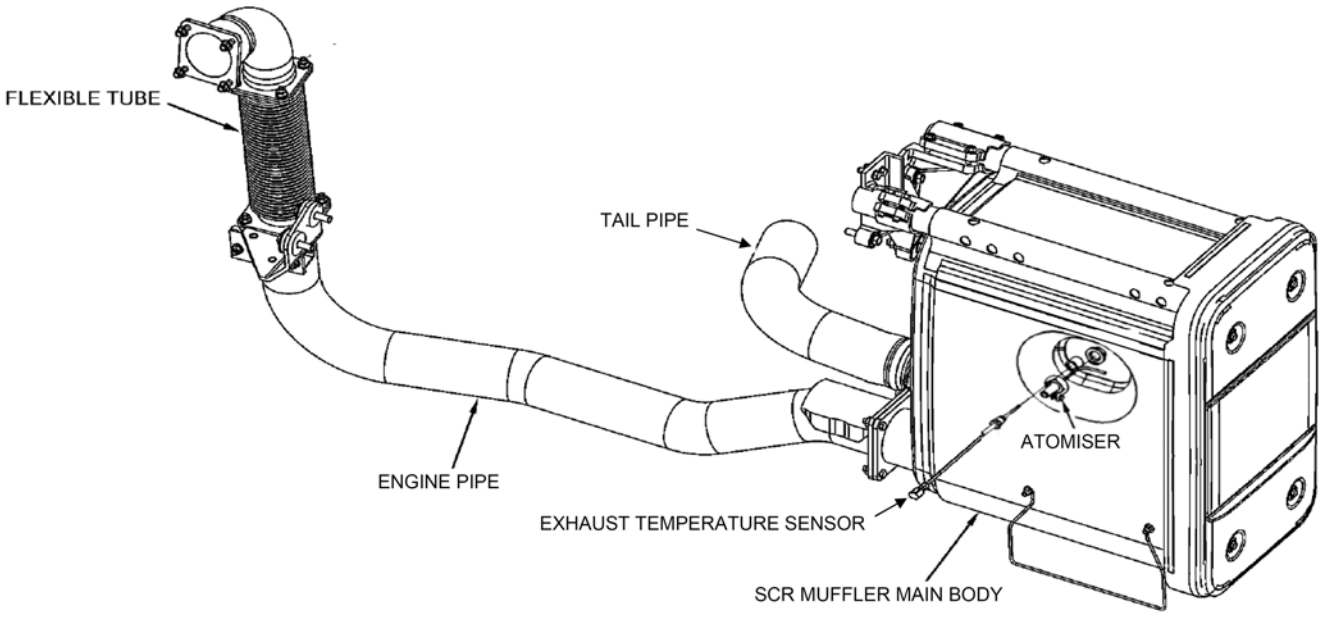
CWB Series: SCR Layout shown



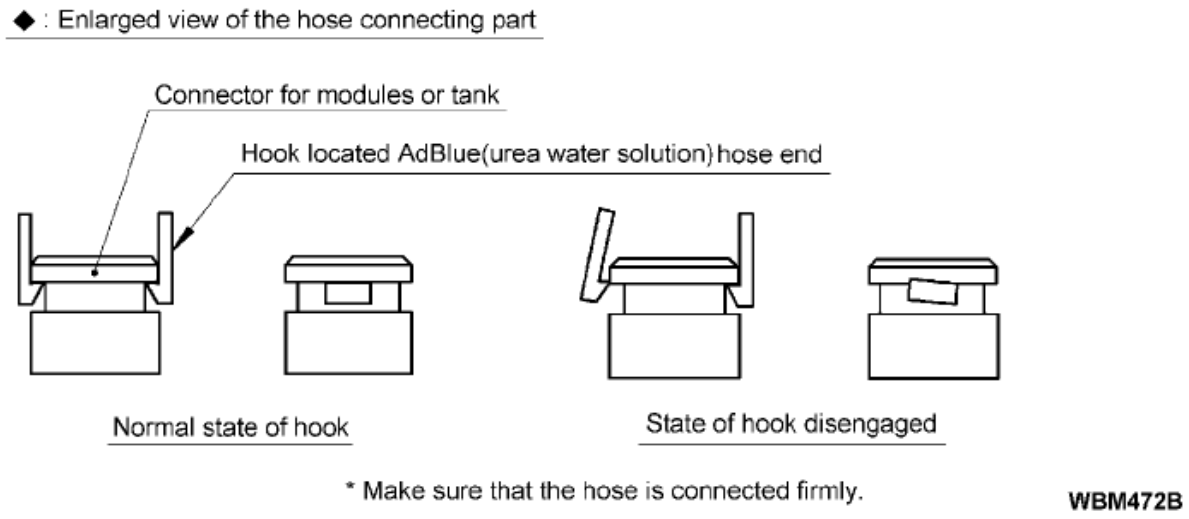
DO NOT RELOCATE OR MODIFY ANY PARTS OF THE SCR SYSTEM

GKB, GWB Series: SCR and Exhaust System Layout shown





The AdBlue tank hose connectors are located near the marks ♦ (ref. CWB series illustration). After conducting the body installation operation around these areas, visually check for the engagement of the connector hooks located on the AdBlue hose ends regardless of whether the hoses were disconnected.

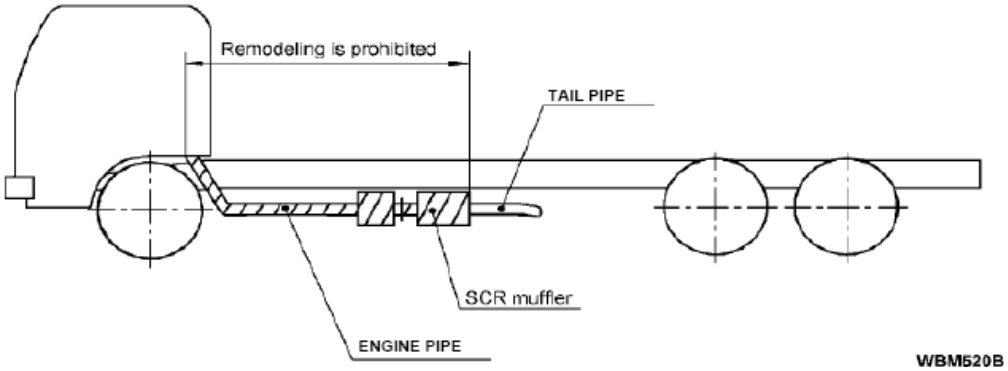

◆ : Enlarged view of the hose connecting part
Connector for modules or tank
Hook located AdBlue(urea water solution) hose end
Normal state of hook
State of hook disengaged
* Make sure that the hose is connected firmly.
WBM472B

Link to AdBlue MSDS: http://www.air1.info/en/index.html then select Air1 icon in the LHS panel and follow the path to Data Sheet then to Air1® (Yara Australia Pty Ltd)

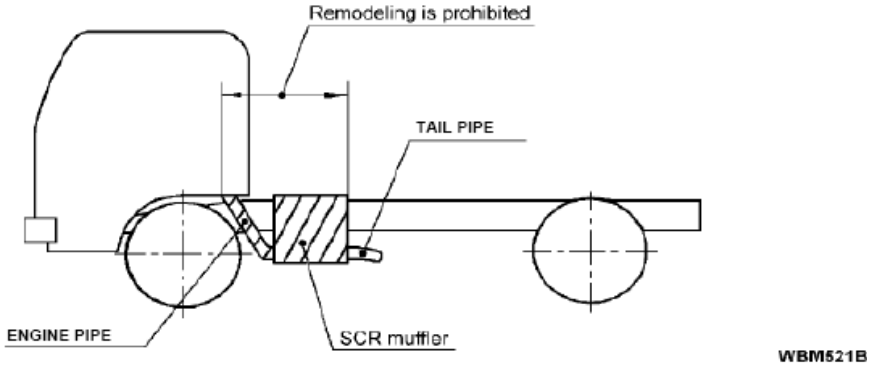
REMODELING THE EXHAUST SYSTEM

The remodelling of the **muffler**, **front engine pipe** and **ADR 83/00 noise reduction shields** is prohibited. To prevent a fire, adverse effects on the SCR muffler and non conformance to emission regulations the remodelling of the exhaust system except the tail pipe is prohibited.

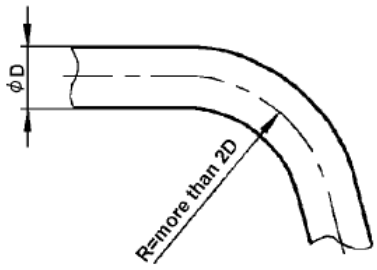
CWB Series



GKB, GWB Series



1. Remodelling the tail pipe
   When modifying or remodelling the tail pipe, observe the following precautions.
   1) The tail pipe shall have the same material (stainless), diameter, surface treatment, etc. as those of Nissan Diesel genuine parts.
   2) Extension or further bending of the pipe may cause an increase in exhaust resistance, reduction of engine output, increase of fuel consumption, increase in the concentration of exhaust gas, etc. Exhaust back pressure must not be increased above that of the standard vehicles exhaust system. The bending radius of the pipe should be more than twice the pipe diameter as shown in the figure below, and the number of bending portions should be three at maximum.



   3) Adopt an elastic support for supporting the tail pipe and use the same support method as the standard vehicle.
   4) For the direction of the tail pipe opening, strictly observe the respective ADR, State and Territory regulations.
   5) Do not install a spark arrestor, because it substantially increases the exhaust pressure and adversely affects the SCR muffler and engine.
   6) Any modification of the vehicles tail pipe will effect the vehicles noise compliance (ADR 83/00).
      It is the responsibility of the modifier to ensure the vehicles continued compliance with ADR 83/00.

OTHER

Refer the following sections of this manual for guidelines relating to:

- Chassis Layout
- PTO Specifications
- Electrical System
- Air System
- Painting

TIGHTENING TORQUE OF GENERAL CHASSIS BOLTS

The tightening torque of the bolts and other fasteners that secure the major components parts is specified in the UDTC Service Manual. In the case where there is no mention of tightening torque, general chassis bolts and fasteners should be tightened according to the following tables of bolt standard tightening torque.

NOTE: All bolts and nuts are sized using the metric system. Do not use parts other than those designated.

Nominal Size	Bolt Ø mm	Pitch mm	Standard Tightening Torque: Nm (without lubricant)					
			Standard Bolt			Bolt with Flange		
			4T	7T	9T	4T	7T	9T
M3	3.0	0.5	0.7	1.1	1.6	0.9	1.2	1.5
M3.5	3.5	0.6	0.9	1.5	2.0	1.2	2.0	2.5
M4	4.0	0.7	1.5	2.5	3.5	2.0	3.0	4.0
M5	5.0	0.8	2.9	5.0	7.2	4.0	7.0	9.0
M6	6.0	1.0	5.1	8.4	12.0	7.0	11.0	13.5
M8	8.0	1.25	13	21	29	17	28	35
		1.0	13	22	31	17	28	35
M10	10.0	1.5	25	41	59	35	55	80
		1.25	25	43	62	35	55	80
M12	12.0	1.75	42	71	98	55	100	130
		1.25	46	77	108	65	100	130
M14	14.0	1.5	74	127	177	100	170	210
M16	16.0	1.5	108	186	275	130	250	290
M18	18.0	1.5	167	275	392	210	350	420
M20	20.0	1.5	226	382	549	290	490	640
M22	22.0	1.5	304	510	736	420	720	880
M24	24.0	2.0	275	461	667	-	-	-
		1.5	284	481	686	-	-	-

NOTE

- **Special parts are excluded.**
- **This standard above is applicable to bolts having the following marks embossed on the bolt head.**

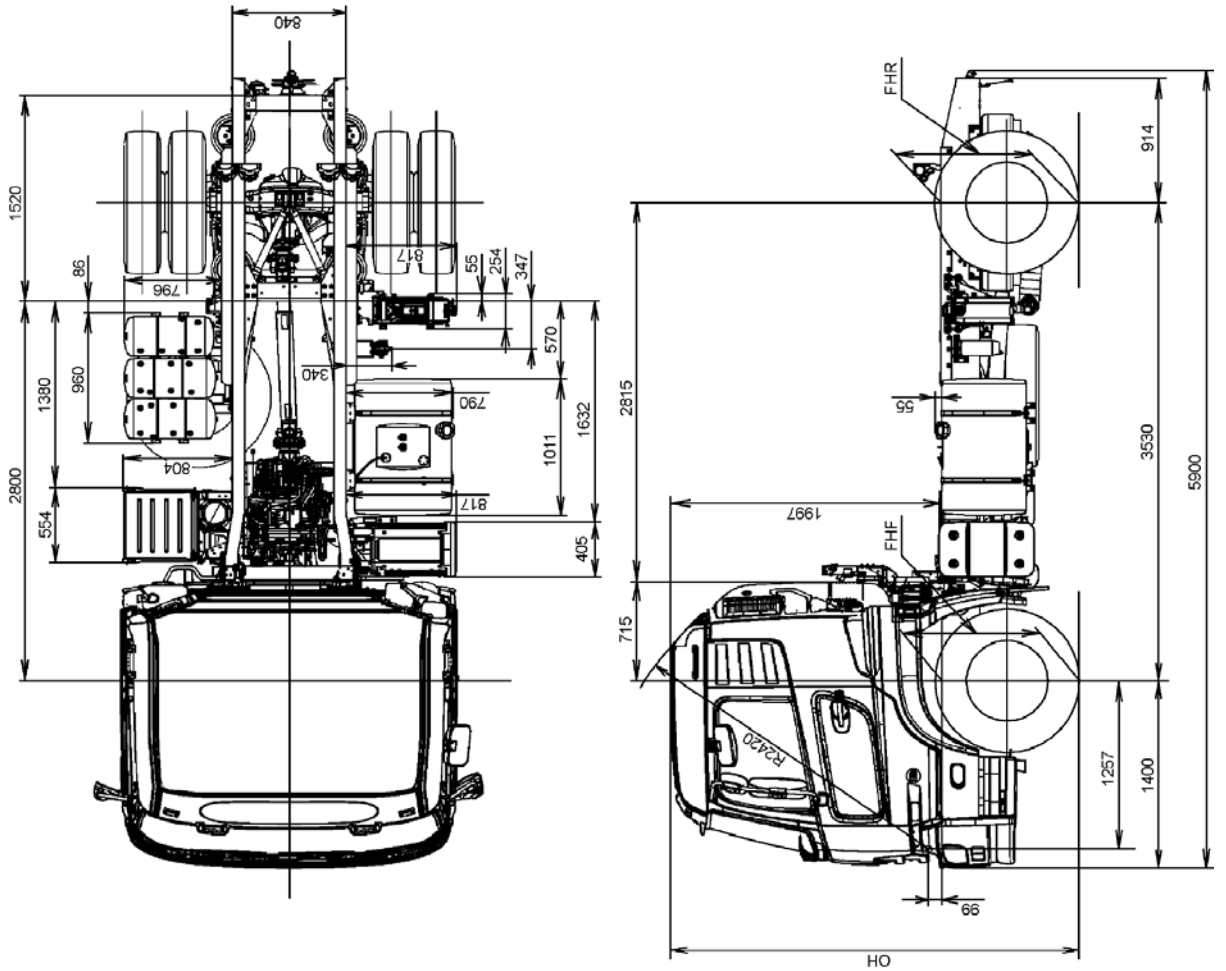
Material Code	Mark
4T	**4 or 40**
7T	**7 or 70**
9T	**9 or 90**

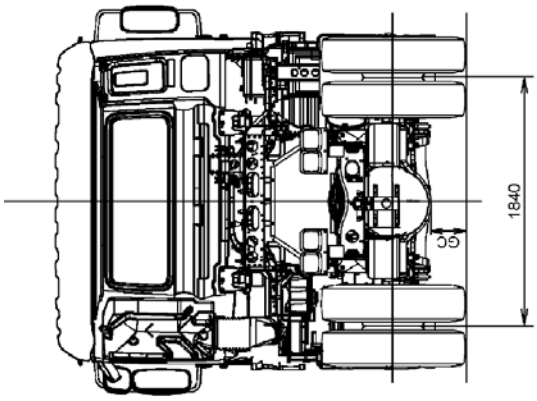
Flange Bolt (Mark F)

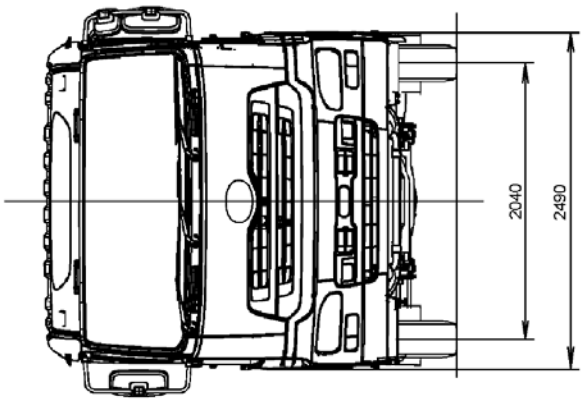
Nominal Size	Bolt Ø mm	Pitch mm	Recommended Tightening Torque: Nm
M8	8.0	1.25	27
M10	10.0	1.25	59
		1.5	54
M12	12.0	1.25	118
		1.5	108

WGE122A

CHASSIS LAYOUT: GKB4DAD (Air suspension)







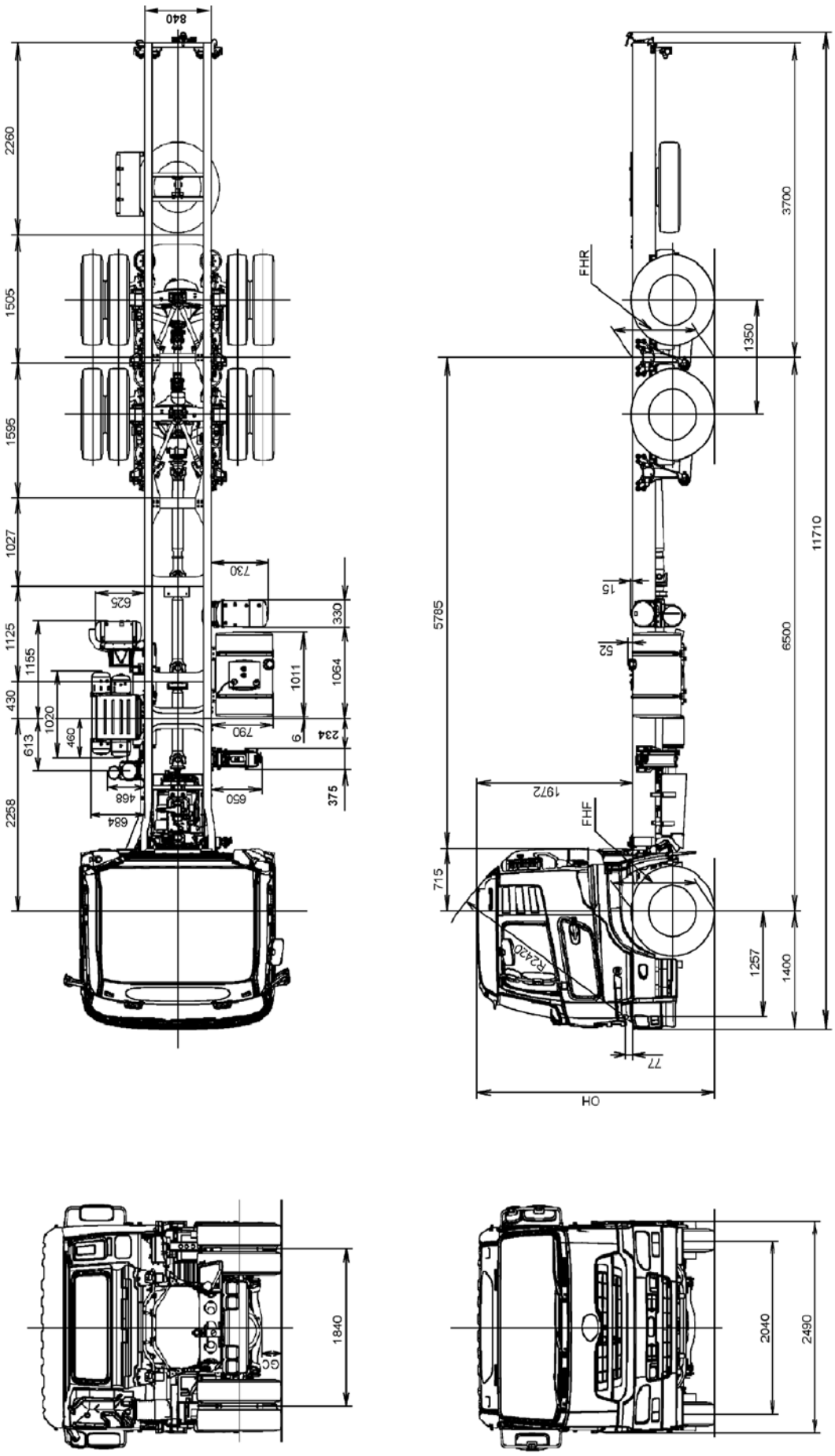
Unit: mm

TYRE SIZE	HEIGHT OH	FHF	FHR	GC
11R22.5	2963	962	1010	235
295/80R22.5 (front) 11R22.5 (rear)	2965	964	1010	235

GKB4DAD (Air suspension)

WARNING: If the fifth wheel angles are removed to facilitate body/equipment installation, to ensure the ongoing integrity of the frame structure, the attaching bolts MUST be refitted and tightened to the specified tightening torque published in the NDMC Service Manual.

CHASSIS LAYOUT: CWB4DAW (Air suspension)



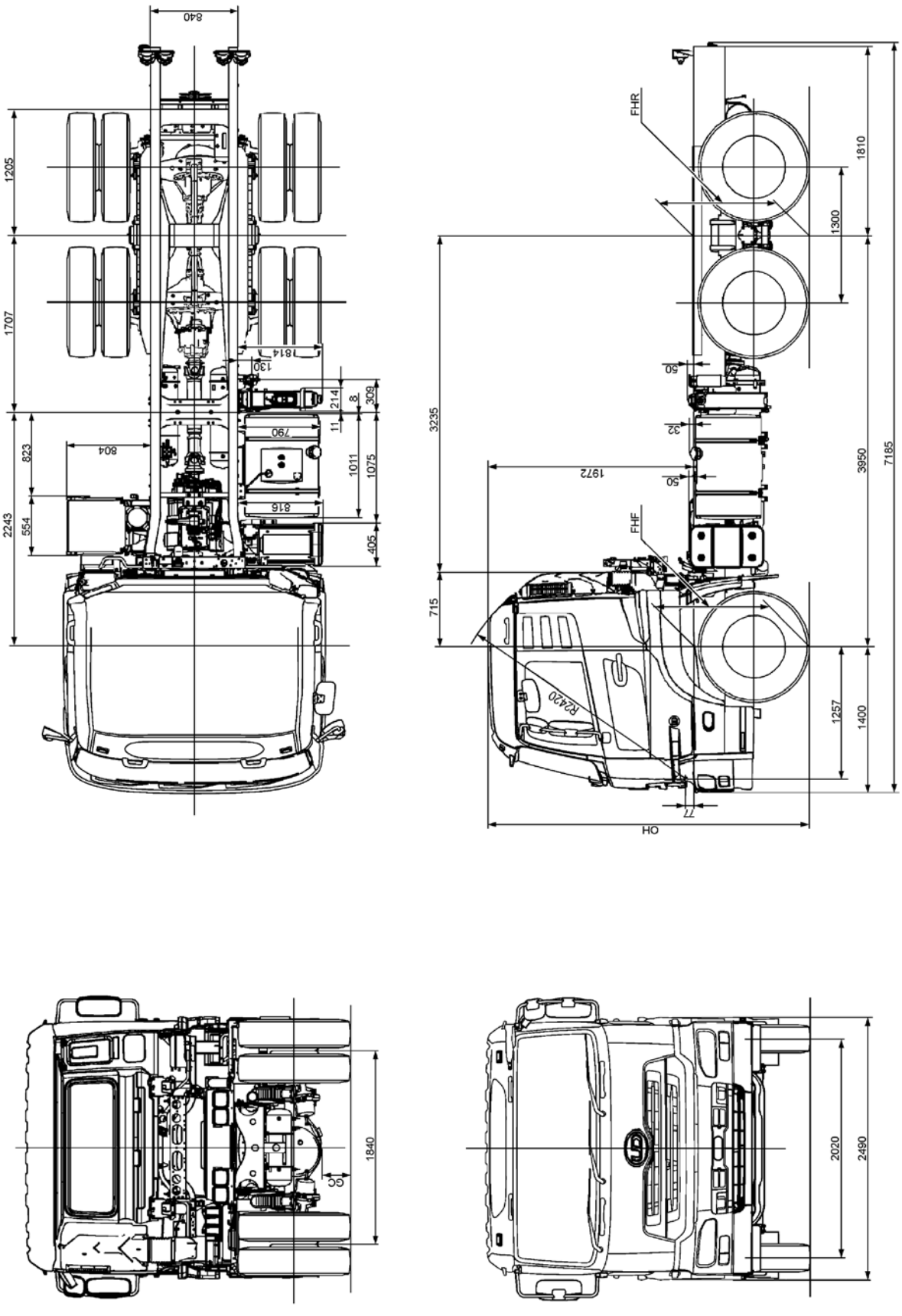
Unit: mm

TYRE SIZE	HEIGHT			
	OH	FHF	FHR	GC
11R22.5	2960	985	1031	225
275/70R22.5	2915	940	986	180

CWB4DAW (Air suspension)

CAUTION: Due to rear suspension torsional loadings the wheelbase of this model must not be shortened to less than 5500mm.

CHASSIS LAYOUT: GWB4DLH (Trunnion suspension)



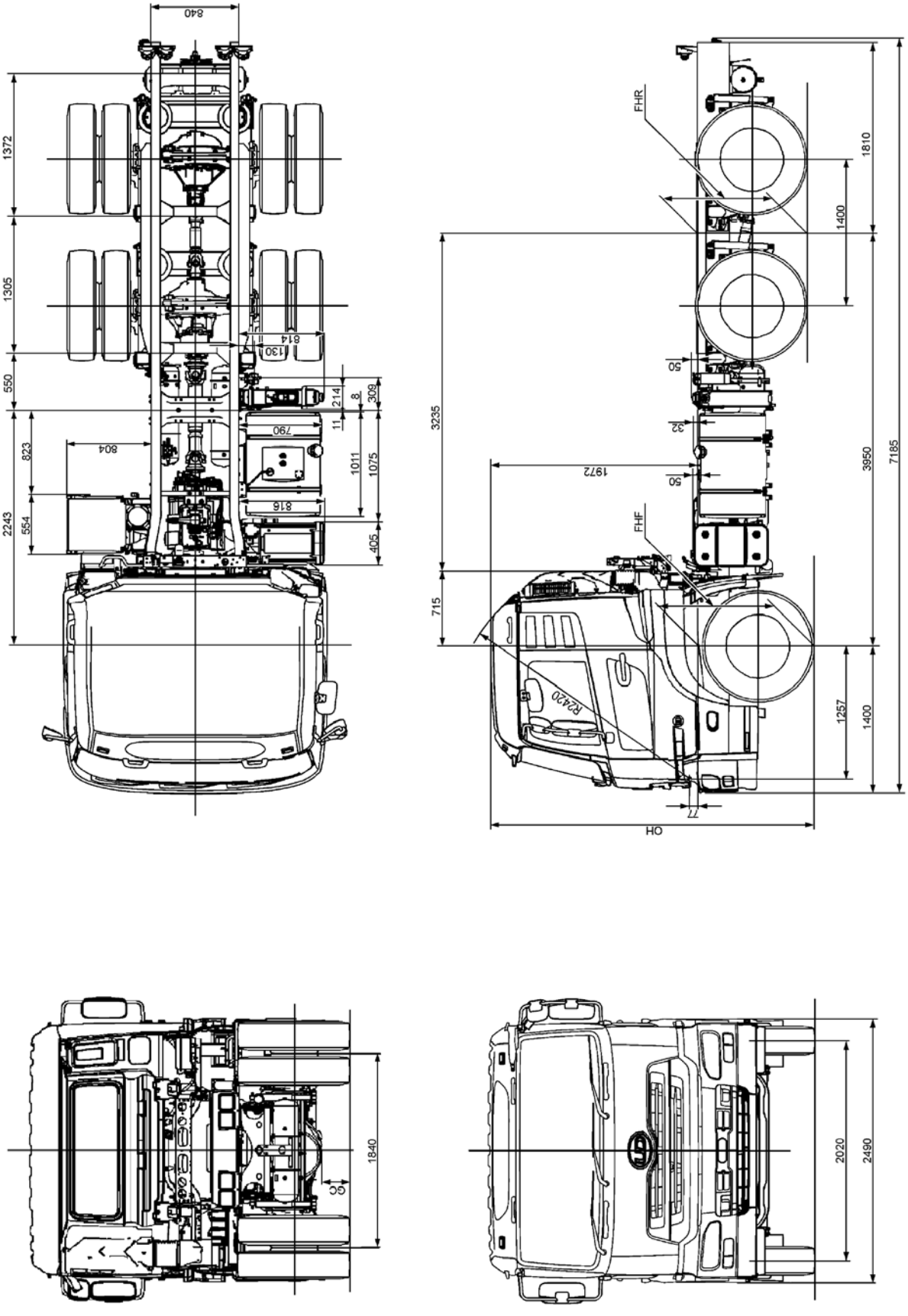
Unit: mm

TYRE SIZE	HEIGHT (# 3 leaf front springs -20mm)			
	OH	FHF	FHR	GC
11R22.5	#2997	#1018	1098	260
295/80R22.5 (front) 11R22.5 (rear)	#2999	#1020	1098	260

GWB4DLH (Trunnion suspension)

WARNING: If the fifth wheel angles are removed to facilitate body/equipment installation, to ensure the ongoing integrity of the frame structure, the attaching bolts MUST be refitted and tightened to the specified tightening torque published in the NDMC Service Manual.

CHASSIS LAYOUT: GWB4DAH (Air suspension)



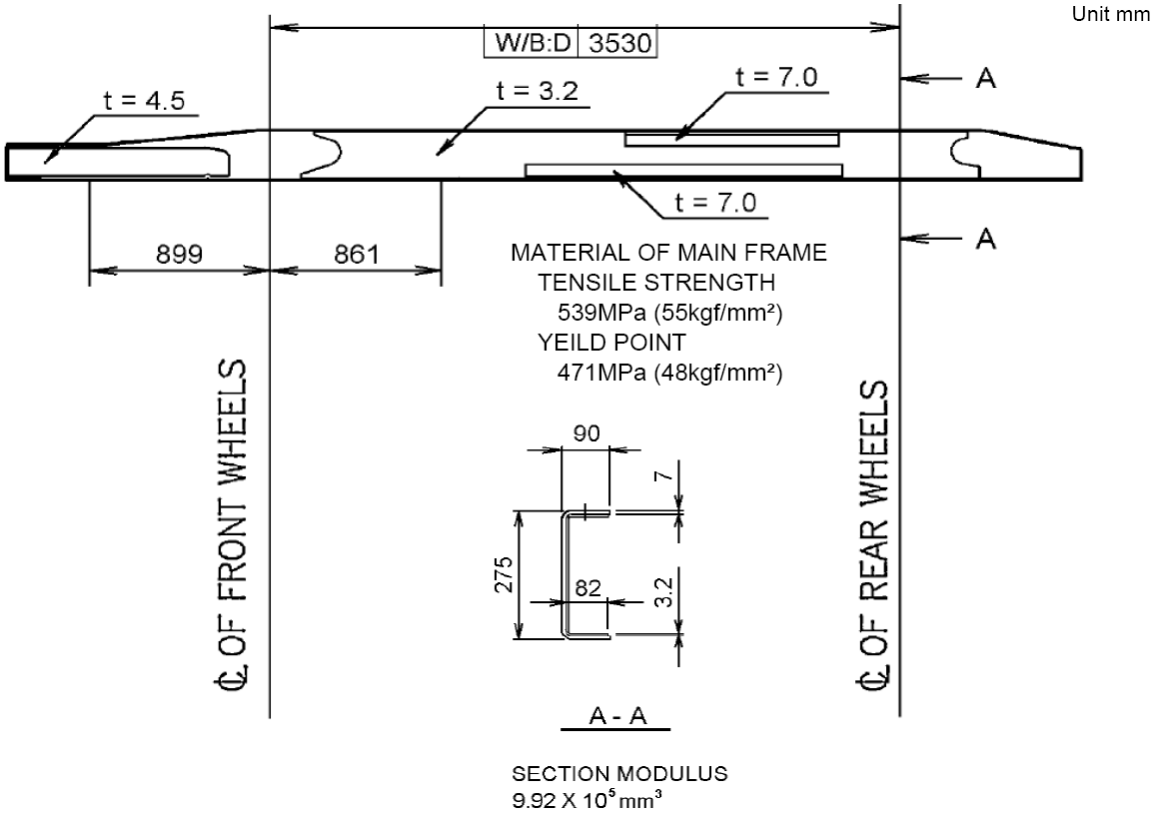
Unit: mm

TYRE SIZE	HEIGHT (# 3 leaf front springs -20mm)			
	OH	FHF	FHR	GC
11R22.5	#2993	#1018	1050	260
295/80R22.5 (front) 11R22.5 (rear)	#2995	#1020	1050	260

GWB4DAH (Air suspension)

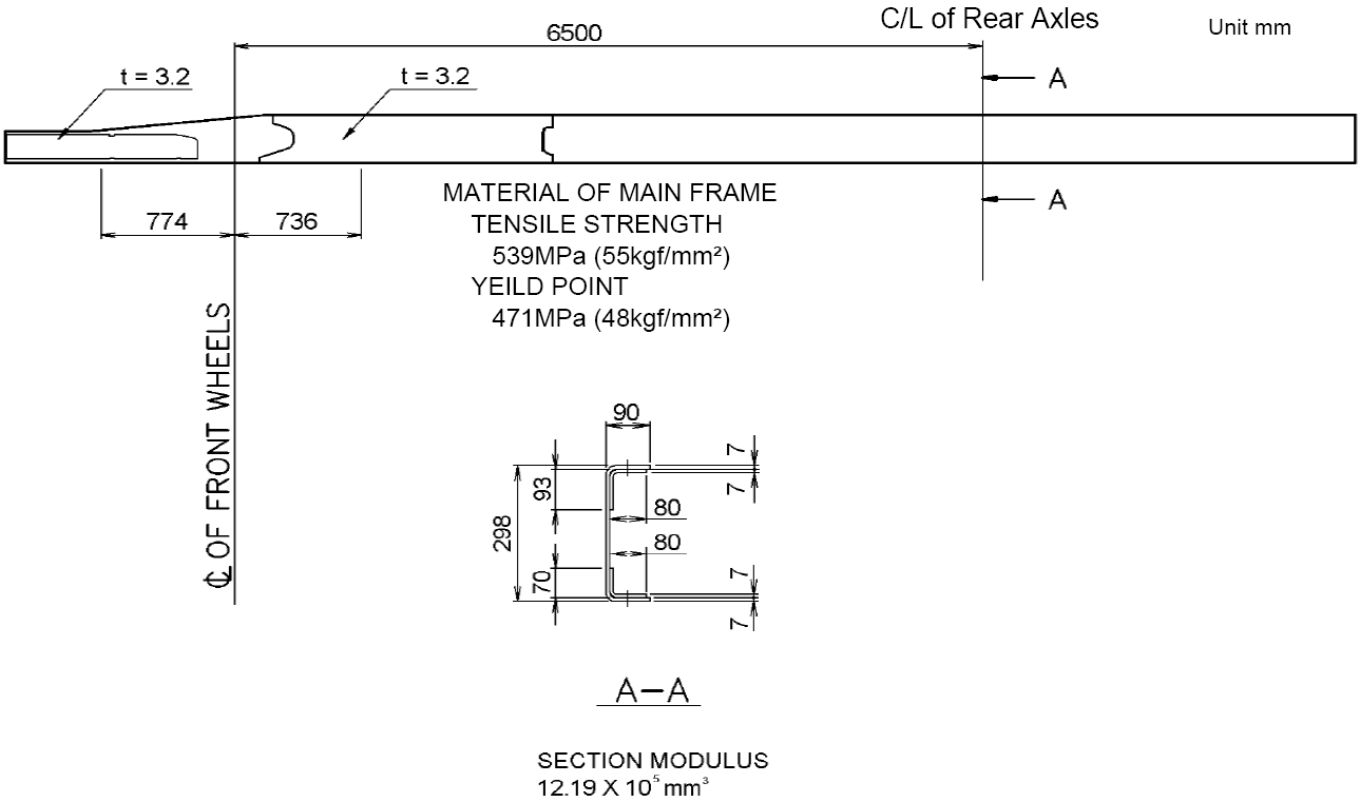
WARNING: If the fifth wheel angles are removed to facilitate body/equipment installation, to ensure the ongoing integrity of the frame structure, the attaching bolts MUST be refitted and tightened to the specified tightening torque published in the NDMC Service Manual.

SECTION MODULUS: GKB4DAD (Air suspension)



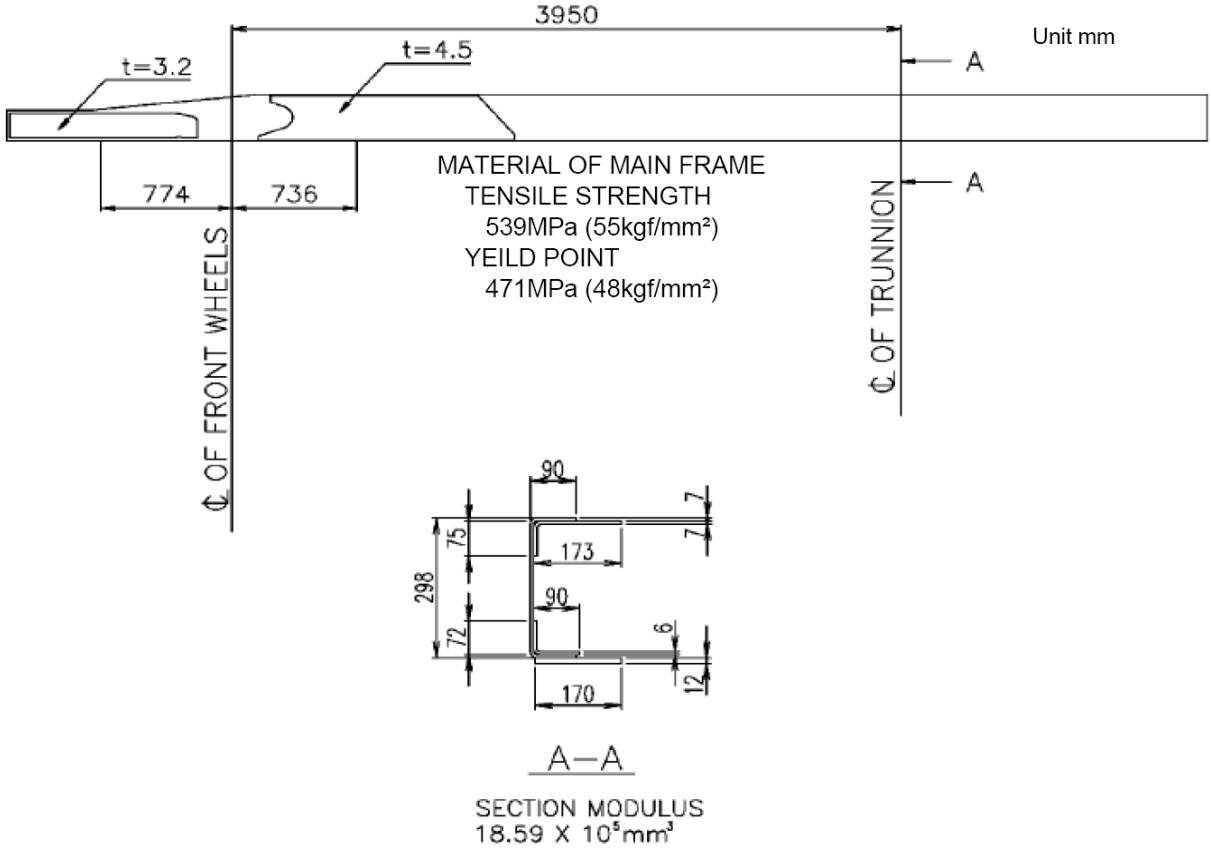
SECTION MODULUS
$9.92 \times 10^5 mm^3$

SECTION MODULUS: CWB4DAW (Air suspension)

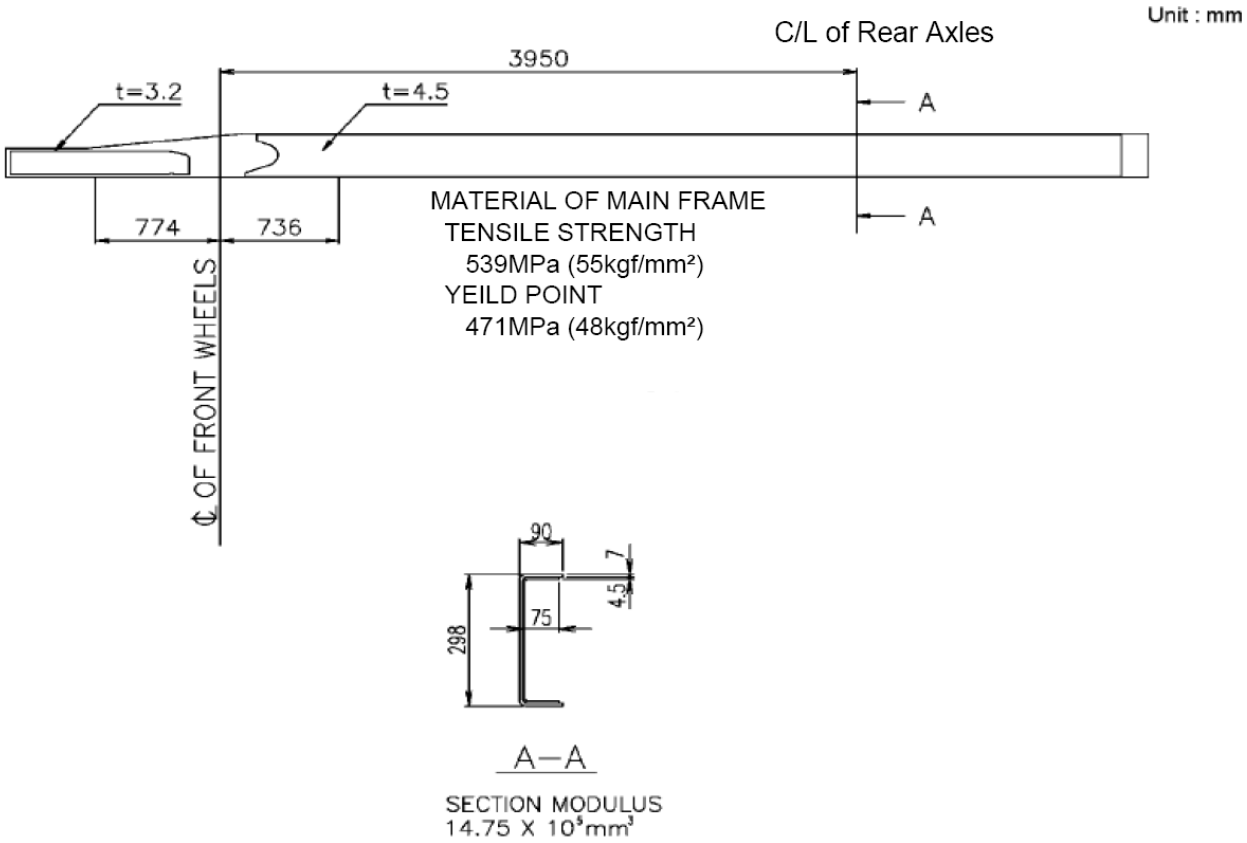


SECTION MODULUS
$12.19 \times 10^5 mm^3$

SECTION MODULUS: GWB4DLH (Trunnion suspension)

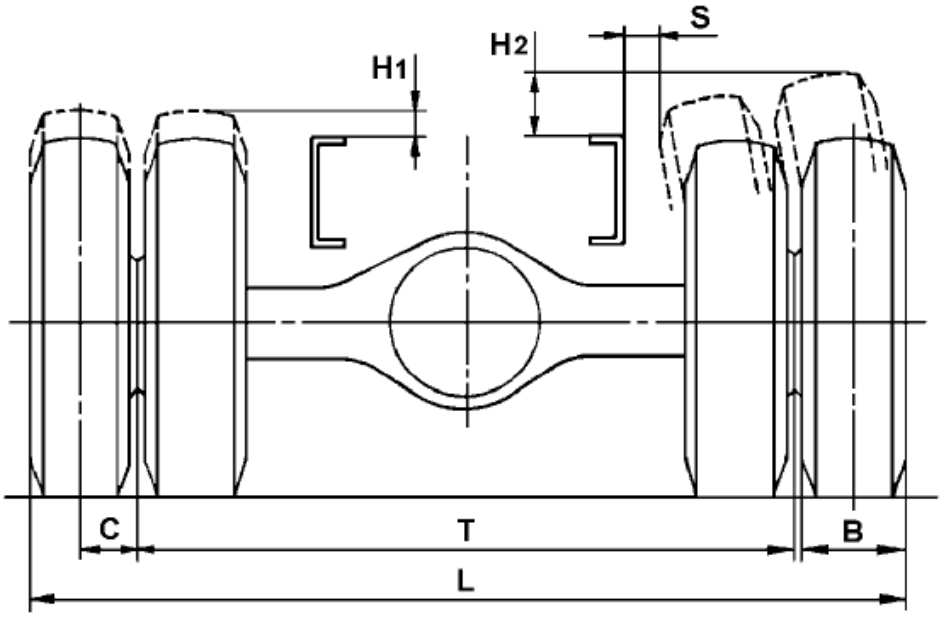


SECTION MODULUS: GWB4DAH (Air suspension)



ALLOWANCE FOR REAR AXLE, SUSPENSION & TYRE ARTICULATION

1. Allowance for Tyre Movement



Unit: mm

		GKB4DA	CWB4DA		GWB4DL		GWB4DA	
Suspension		Air	Air		Trunnion		Air	
Position	Tyre	Rear Axle	Rear/Front Axle	Rear/Rear Axle	Rear/Front Axle	Rear/Rear Axle	Rear/Front Axle	Rear/Rear Axle
H1	11R22.5	135	112 (*66)	108 (*62)	105	82	61	61
H2		220	194 (*149)	190 (*145)	201	179	110	110
S		183	187 (*187)	188 (*188)	141	141	186	186

Tyre	Disc Wheel Size	Offset C	Tread T	Tyre Growth Width B	Maximum Width L
11R22.5	22.5 × 8.25-165, 13TCS	165	1838 #1858	279 (*276)	2447 (*2444) #2467 (*2464)

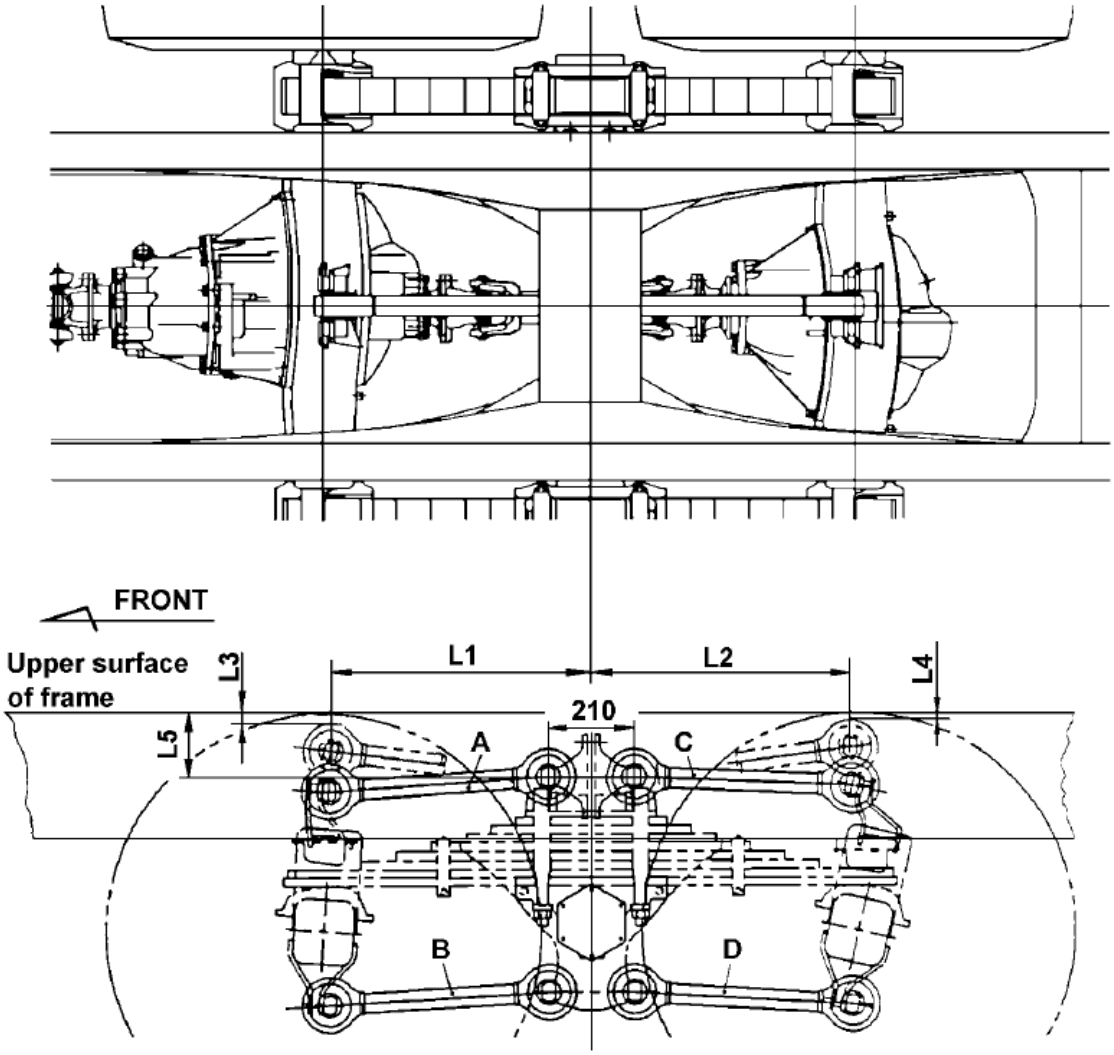
Note:

- (*) indicates optional 275/70R22.5 tyres CWB4DA model only.
- # indicates the data when optional aluminium wheels are fitted.
- When installing tyre chain, add 50mm to H1 and H2 dimensions.
- The tyre growth width: B indicates the value from JATMA.

2. Allowance for Rear Axle Movement

1) Trunnion Suspension (GWB4DL)

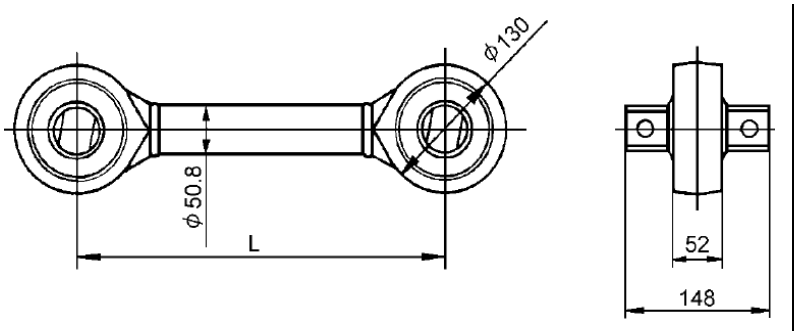
The figures and table below show the maximum ascending position of the upper torque rod between frames. Be careful not to cause an interference when installing the body, fuel tanks, rear wheel guards, etc.



Unit: mm

Position	
L1	633
L2	635
L3	13
L4	23
L5	163.5

Torque Rod	L (length)
A	535
B	535
C	535
D	535



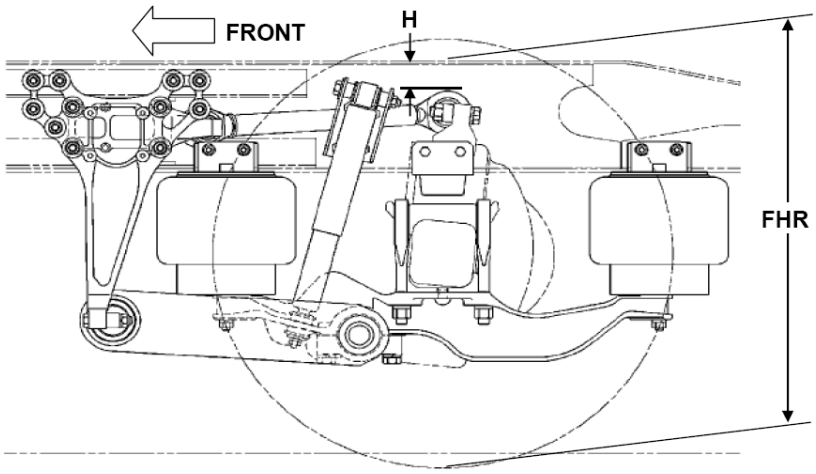
CAUTION

- **L3 and L4 = the maximum ascending position of the upper torque rods where the axles are in metallic contact.**

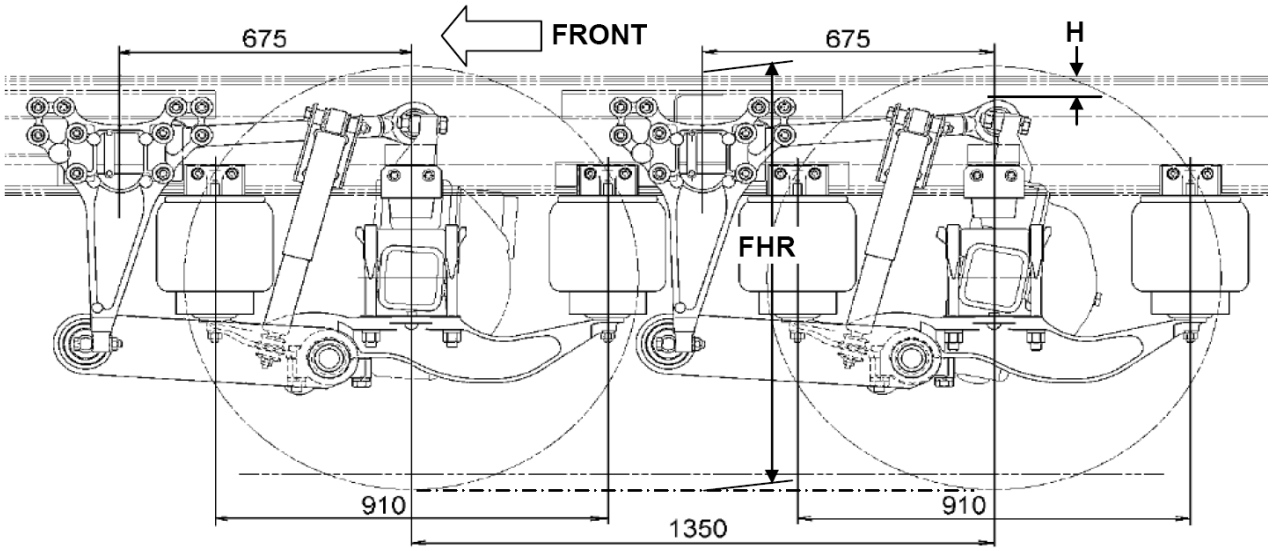
2) Air Suspension – Full Floating Type (GKB4DA, CWB4DA)

The figures and table below show the maximum ascending position of the upper V-Rod between frames. Be careful not to cause an interference when installing the body, fuel tanks, rear wheel guards, etc.

GKB4DA 4x2



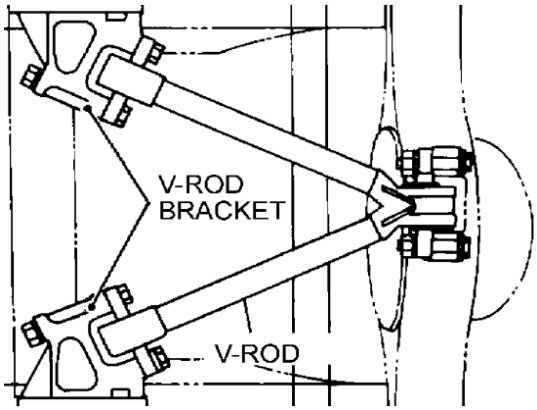
CWB4DA 6x4



Unit: mm

Position		Height Setting	GKB4DA	CWB4DA
FHR		Raised	1165	1085 (*1040)
		Normal	1010	1031 (*986)
		Lowered	940	974 (*929)
H	a) Lowered		16	Rr/Rr 0
	b) Compressed		-3	Frt/Rr -26 Rr/Rr -28

Note: (*) indicates optional 275/70R22.5 tyres CWB4DA model only.



V-ROD (upper location/torque rod)

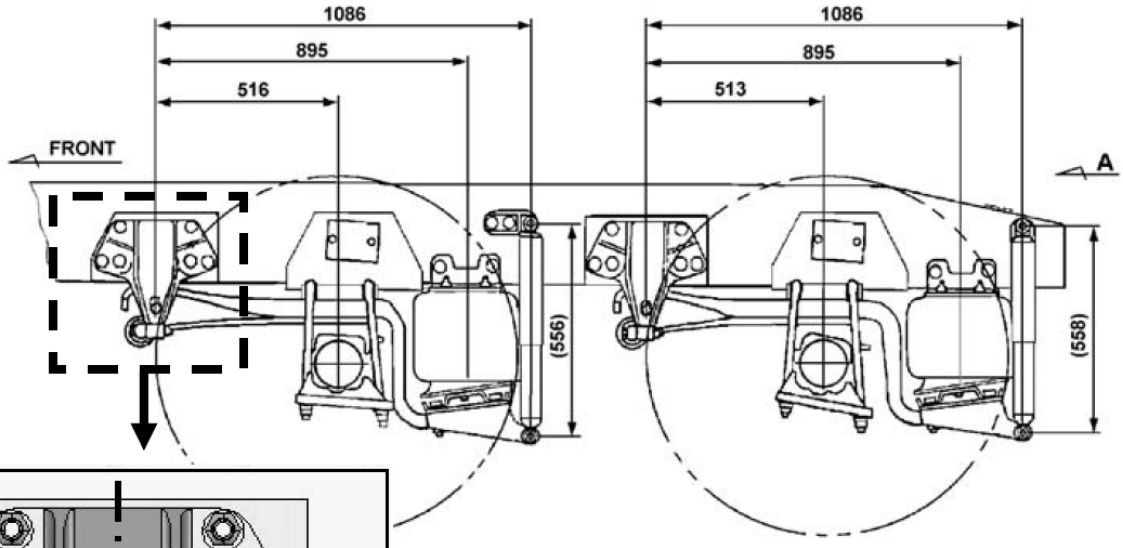
CAUTION

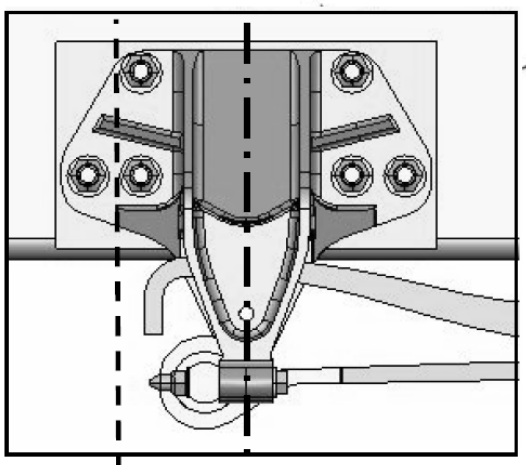
- **H = the maximum ascending position of the V-Rod when the air suspension is**
  a) lowered (with no load) and,
  b) bump stop rubbers fully compressed (max. vertical travel).

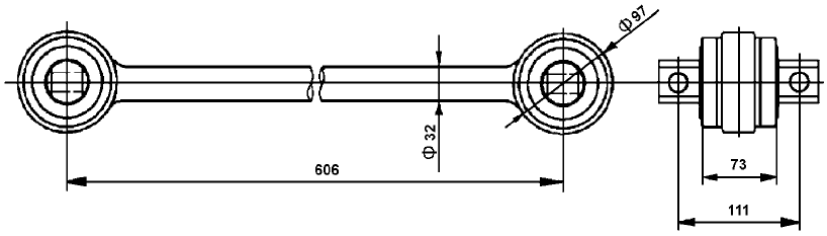
3) Air Suspension - Semi Floating Type (GWB4DA)

The figures and table below show the minimum clearance required forward of the front/rear axle suspension mounting bracket and the maximum ascending position of the lateral rod between frames.
Be careful not to cause an interference when installing the body, fuel tanks, rear wheel guards, etc.

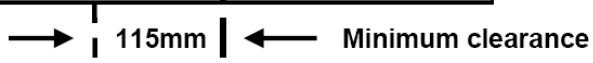
Unit : mm



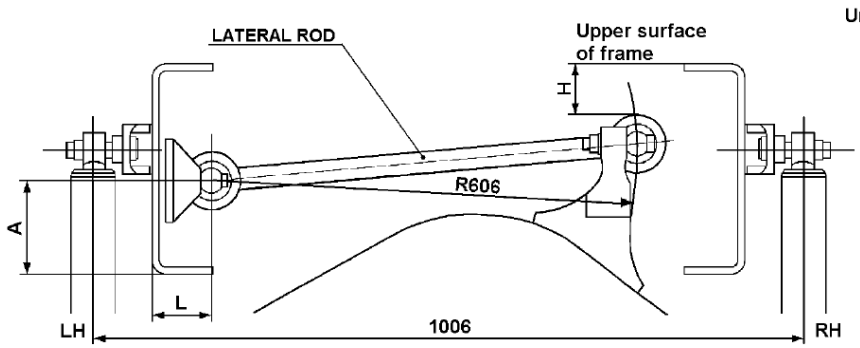




Dimensions of Lateral Rod



Unit : mm



Unit: mm

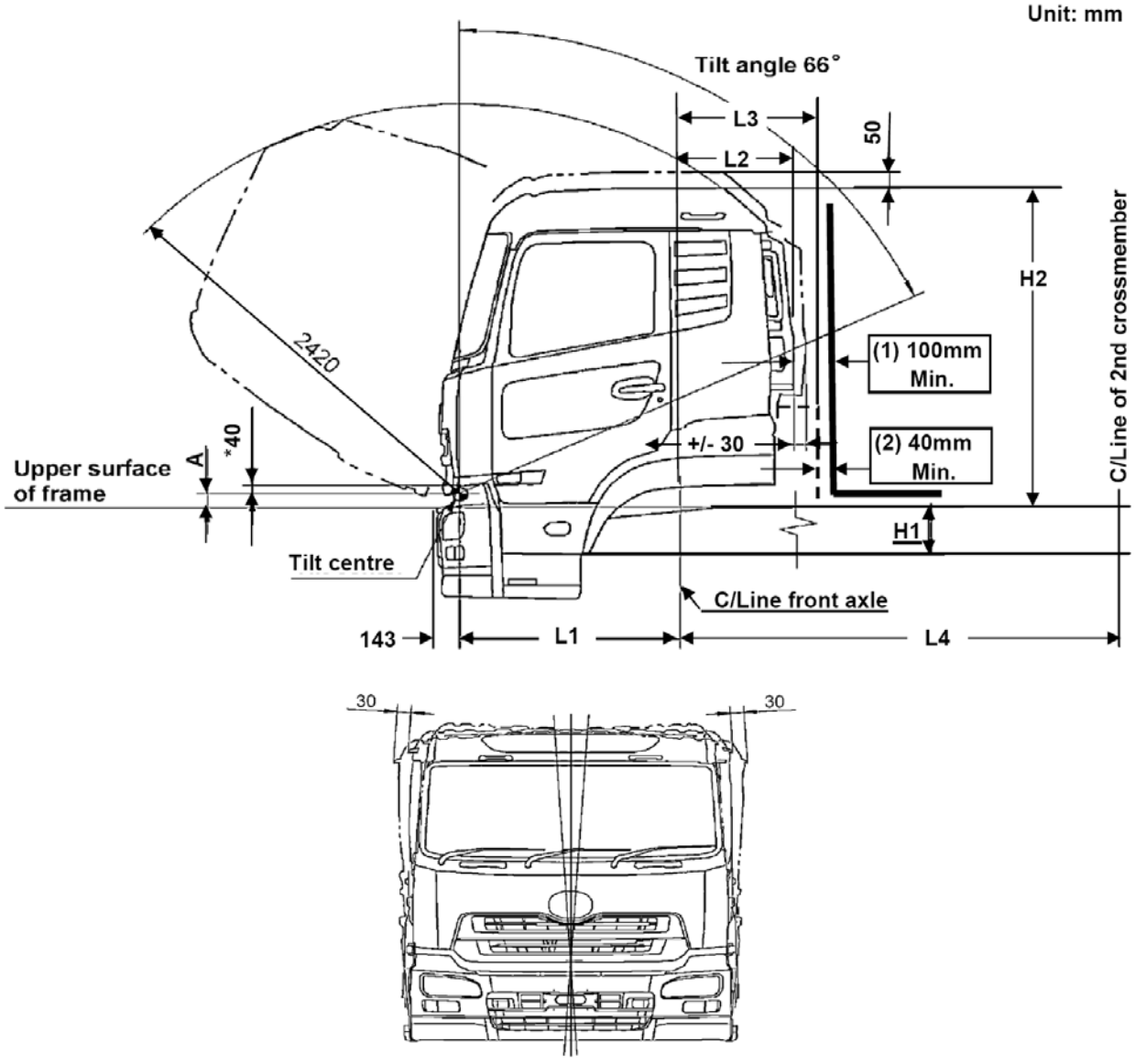
Position	GWB4DA	
L	82.5	
H	71	
A	Ft/Rr Axle 132.4	Rr/Rr Axle 126

CAUTION

- **H = the maximum ascending position of the lateral rod and indicates when the air suspension is fully deflated.**

ALLOWANCE FOR BODY CLEARANCE, CAB TILT & SUSPENSION MOVEMENT

- To accommodate the moving portion of the cab (cab main body, air intake etc.), on the cab suspension of +/- 30mm longitudinal, 50mm vertical and 30mm lateral movement, when installing the rear body/equipment provide a clearance of;
  (1) 100mm or more to the moving portion of the cab and
  (2) 40mm or more between any fixed chassis parts (fluid reservoir, cab support, rear engine cover etc.).
- *When starting to tilt the cab, be careful as the tilt centre raises a maximum of 40mm (i.e. A + 40mm).



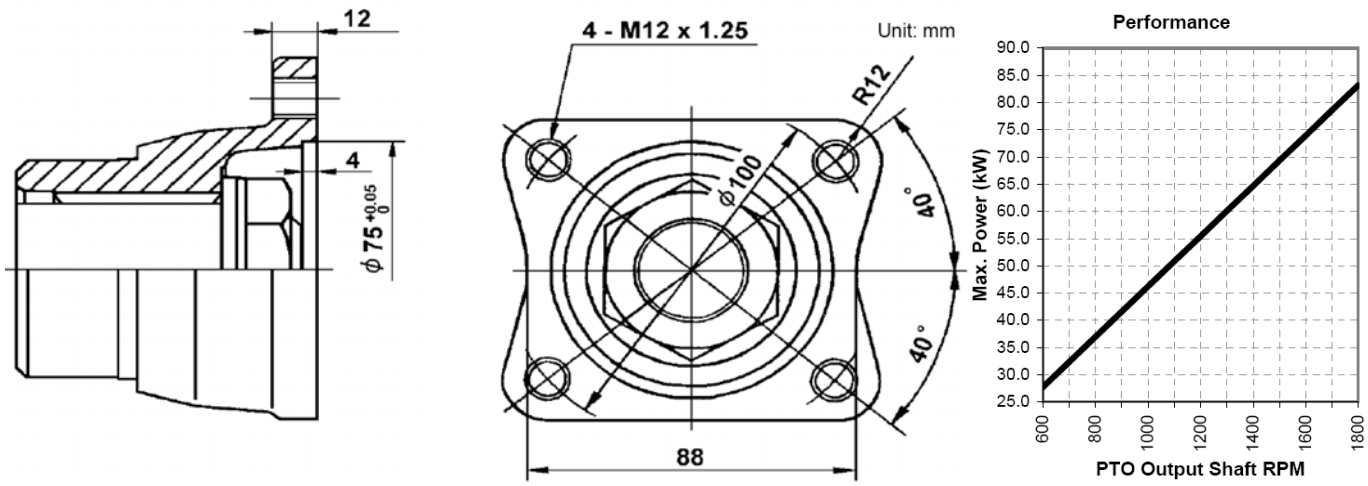
Unit: mm

Vehicle Model	GKB4D	CWB4D	GWB4D
A: Tilt Centre to Frame	99	77	77
L1: Tilt Centre to Front Axle	1257	1257	1257
L2: Front Axle to Air Intake	715	715	715
L3: Front Axle to Cab Support	850	n/a	850
L4: Front Axle to 2nd Crossmember	n/a	2258	2243
H1: Fame Height	275	298	298
H2: Cab to Frame	1997	1972	1972

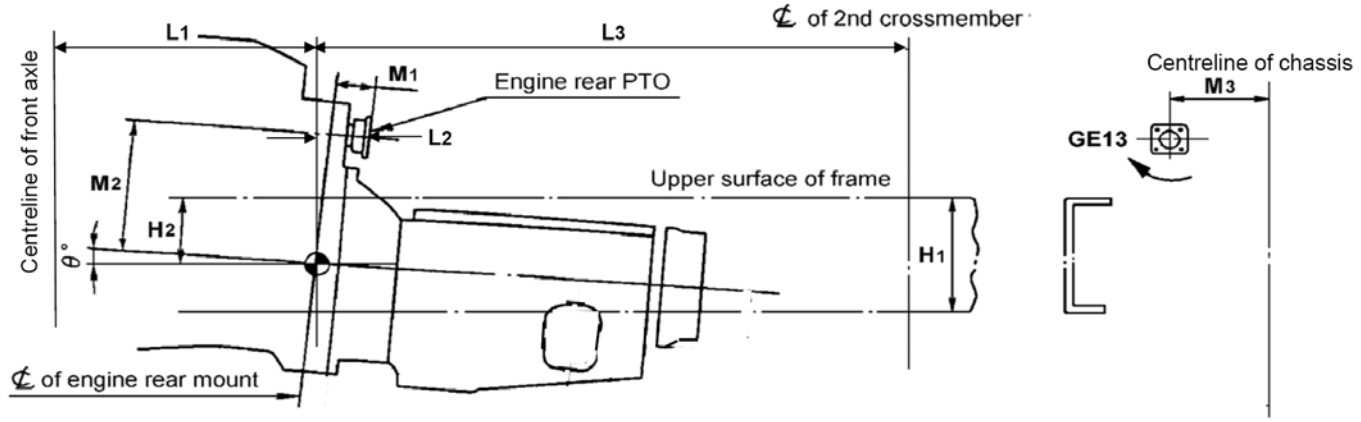
n/a = not applicable

1. REAR ENGINE PTO

Applicable Models	CWB4D, GWB4D
Reduction Ratio (PTO/engine ratio)	1.00:1
Allowable Max. Output Torque	441 Nm {45 kgf.m}
Direction of Rotation	Clockwise when viewed from rear



PTO Drive Flange Dimensions and Performance Chart



Unit: mm

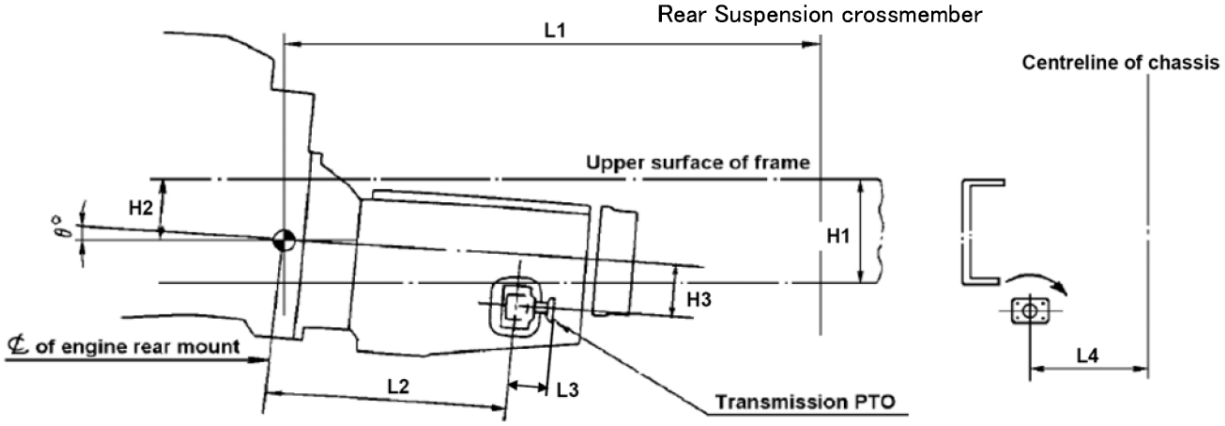
	θ°	H1	H2	L1	L2	L3	M1	M2	M3
CWB4D	3.0°	298.0	255.4	681.7	112.0	1576.3	95.4	434.6	43.0
GWB4D						1561.3			

PTO Location

Issued Date: May 2010

2. TRANSMISSION PTO:

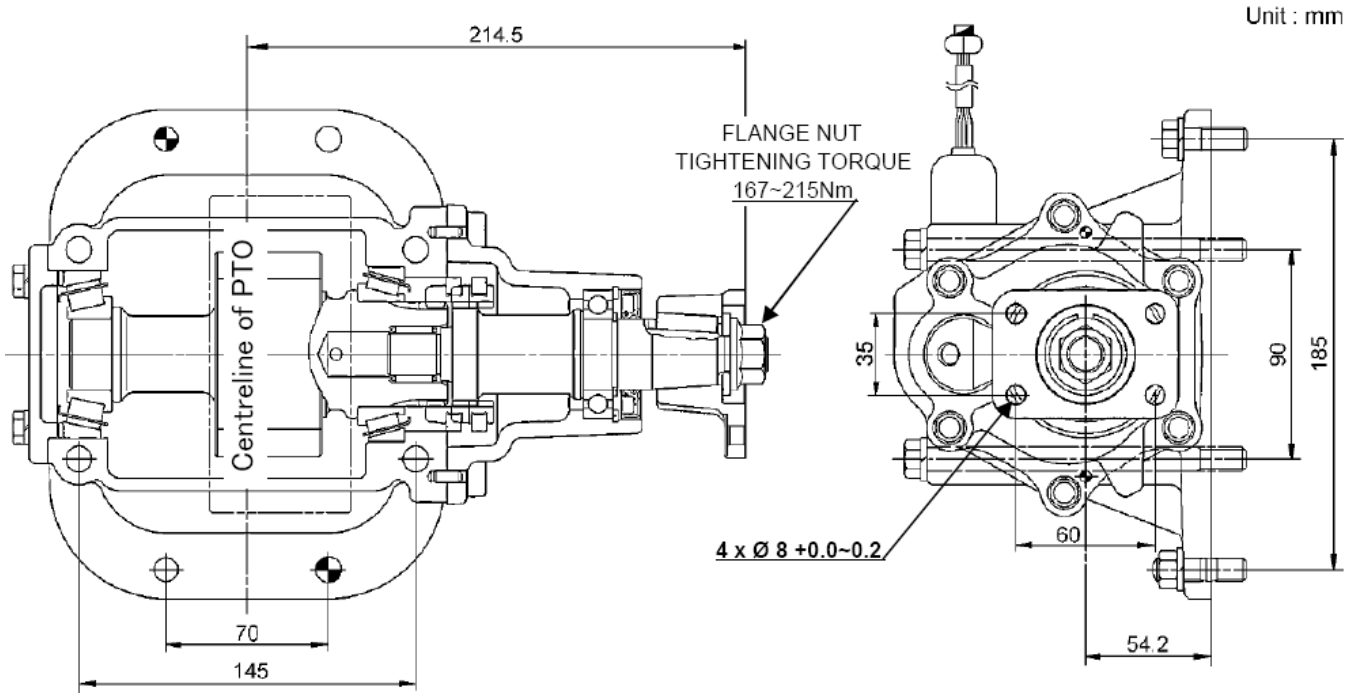
GKB4D Factory Option with APR90A Transmission



Unit: mm

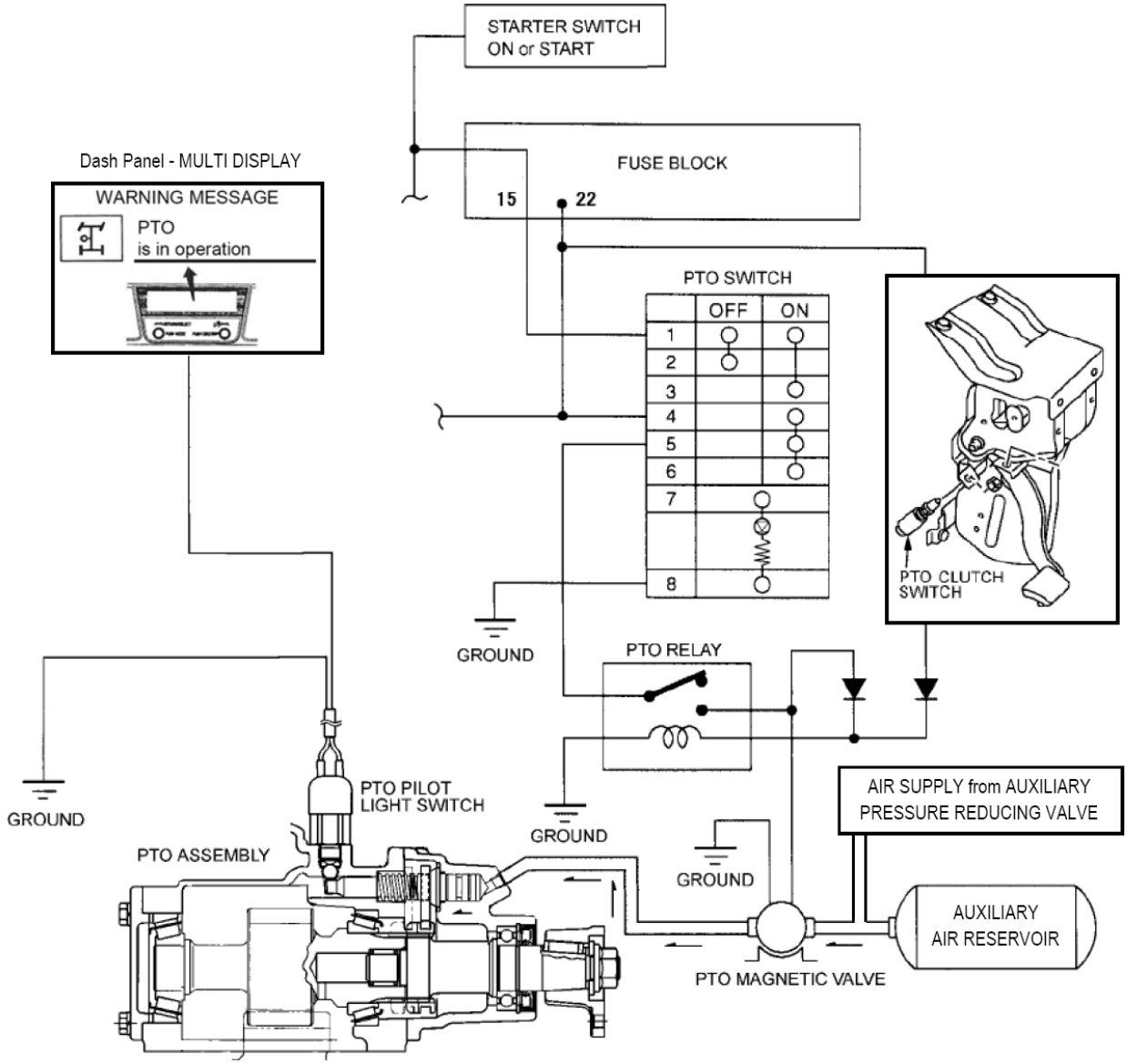
Vehicle Model	Engine Model	Trans-mission Model	PTO Torque Nm (kgf.m) {Reduction}	Rotation Direction	H1	H2	H3	L1	L2	L3	L4	θ
GKB4D	GB13TB	APR90A (10.16~0.75)	490 (50) {1.071}	Clockwise when viewed from rear.	275	267.9	158.2	2120	592.9	214.5	207.6	5.0º

PTO Specification and Location



Chassis Model	Part No. PTO Assembly	Drive Ratio	Part No. Drive Flange
GKB4D	33300 NA006	0.934 x engine speed	38211 91213

Supply Condition: The PTO assembly (including drive flange) is installed to the vehicle during UDTC production.
PTO Operation: A control, as per the following circuit diagram, is installed to the vehicle during production when ordered with the UDTC factory PTO option.



PTO Control Circuit

Note: All chassis-cab models incorporate the PTO circuit electrical harness and this may be utilised to operate locally supplied transmission PTO's by the addition of the listed components.

Qty	Part No.	Part Name.
1	25165 02Z00	PTO Switch
1	25550 00Z12	PTO Relay
1	26335 30Z07	Magnetic Valve
1	25312 0Z000	PTO Clutch Switch[1]
1	08911 3421A	Nut, PTO Clutch Switch[1]
1	46411 Z0004	Stopper, PTO Clutch Switch[1]

[1] **AutoShift models can not be fitted with the PTO clutch switch as it is utilized by the autoshift system.**

For connector locations refer to the "Electrical System – Harness Layout" section of this manual,

Illustration	Connector
Main Harness RH	MR-18 PTO Relay MR-103 PTO Clutch Switch MR-121 PTO Switch
Chassis Harness	CL-21 PTO Magnetic Valve

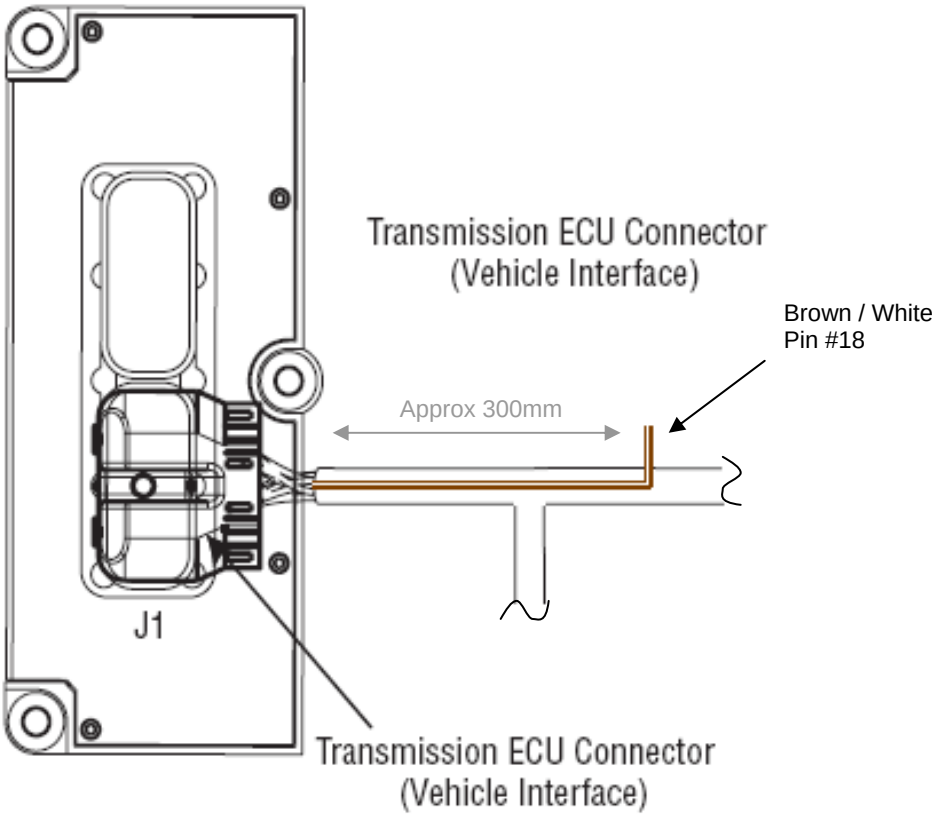
CWB4D, GWB4D with EATON FULLER Transmission

Vehicle Model	Transmission	PTO	
		Allowable Max. Output Torque	Location
CWB4D	RTLO 14913A	Refer to Local Vendor for their Australian Specifications **RHS 6-Bolt PTO opening is not available for AS3 model**	
GWB4D	RTLO 14913A		
	RTLO 18918B		
	RTLO 18918A-AS3		

Autoshift transmission – Electronic gear override

In certain PTO configurations, an override function to engage a direct drive ratio is required.

To put the transmission into "PTO mode" locate the unterminated, Brown / White wire taped to the harness approximately 300mm from the main 38way connector shown must be grounded. The transmission must also be enabled by an authorized Eaton representative to utilize this function.



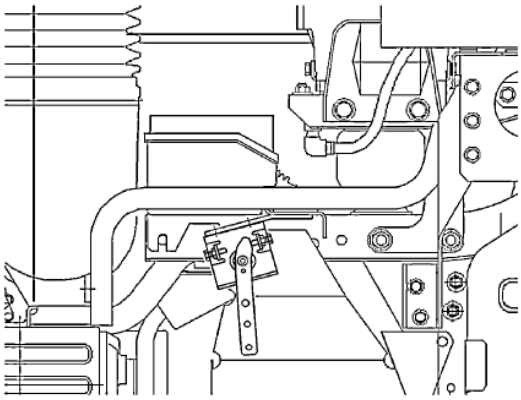
3. ENGINE CONTROL SYSTEM

Engine with Electronic Controlled Fuel Injection System

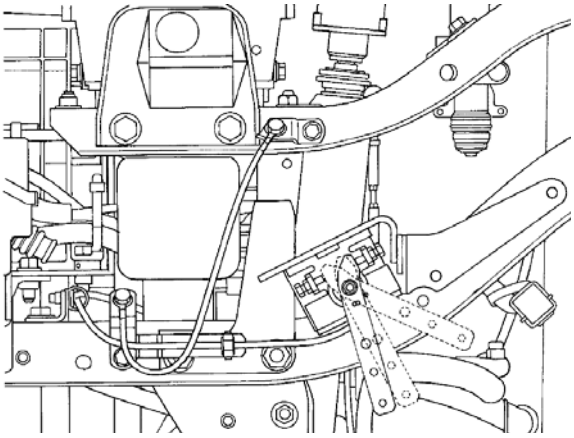
- The engine with electronic controlled fuel injection system does not have a control lever on the injection pump.
- To control the engine from outside the vehicle, an optional external engine control lever unit is available from UDTC production.
- This feature can also be retrofitted to general specification chassis-cab models, by the installation of an external engine control lever unit.
- The control lever unit can be installed to either the cab mount position and connected to the engine harness provided near the air cleaner (Fig. A External Engine Control Lever and Connector), or relocated to any other position by utilising an extension sub-harness, refer to item “b.2. Control Lever Installation Procedure”.
- The characteristics of the governor (driving or all-speed mode) can be switched by connecting or disconnecting the two harness connectors cables (called junction A and junction B) respectively, which are located at the right side of the steering column, adjacent to the brake pedal.

Note: For connecting positions, refer to “Fig. B Location of Junctions A and B”, and item “a. Junction Connection Patterns”.

Installation of the Engine Control Lever Unit
(Part No. 25960 ND00A)



GKB, GWB



CWB

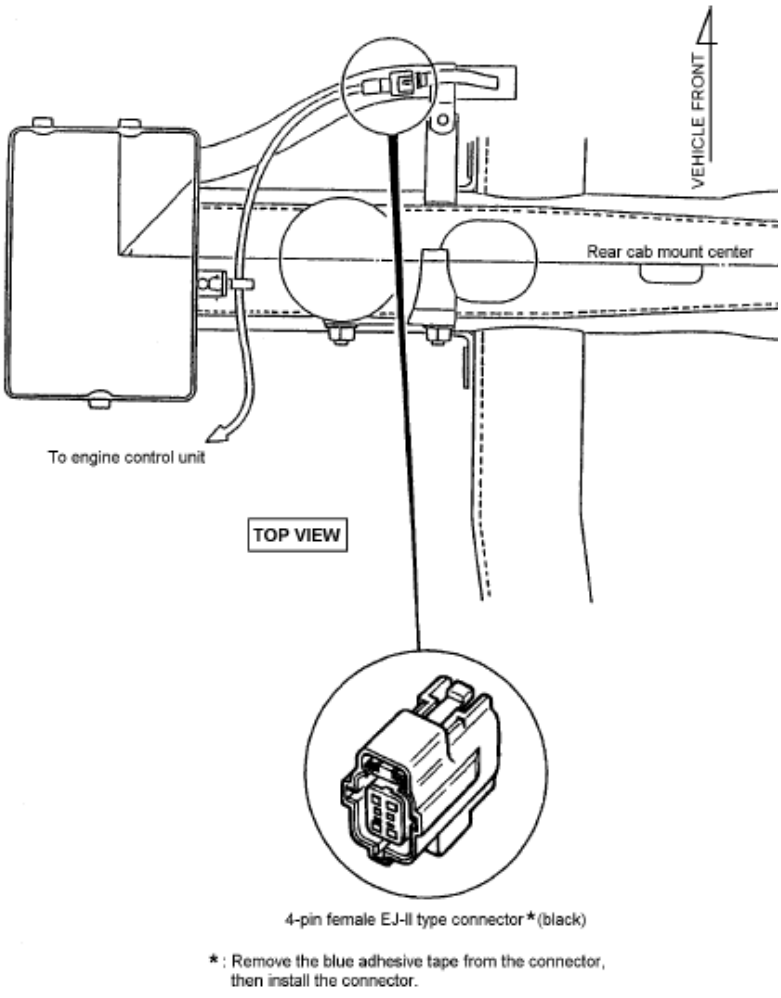

VEHICLE FRONT
Rear cab mount center
To engine control unit
TOP VIEW
4-pin female EJ-II type connector * (black)
* : Remove the blue adhesive tape from the connector, then install the connector.

Fig. A External Engine Control Lever and Connector

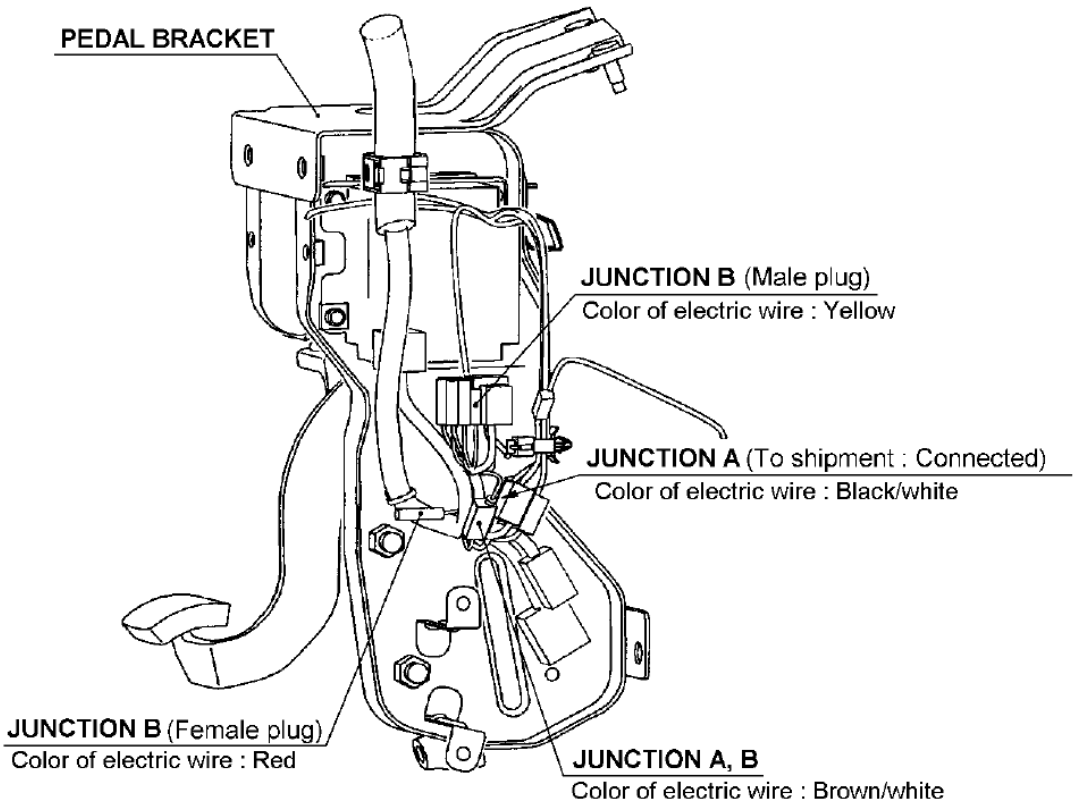

PEDAL BRACKET
JUNCTION B (Male plug)
Color of electric wire : Yellow
JUNCTION A (To shipment : Connected)
Color of electric wire : Black/white
JUNCTION B (Female plug)
Color of electric wire : Red
JUNCTION A, B
Color of electric wire : Brown/white

Fig. B Location of Junctions A and B

CAUTION

- **Junctions A and B have no flags. Connect them based on the wire colours.**
- **There is a harness (with a flag in roman characters) for trouble diagnosis near the Junctions A and B. Be careful not to connect it to any of the PTO junction connectors.**
- **For connection patterns, refer to item "a. Junction Connection Patterns".**

Note: For connector locations refer to the "Electrical System – Harness Layout" section of this manual,

Illustration	Connector
Main Harness RH	MR-102 Junction B-1 MR-111 Junction B-2 MR-112 Junction A-2 MR-134 Junction AB MR-121 PTO/Governor Switch
Engine Harness	E-24 PTO Accelerator Sensor

Explanation of the Functions of Engine Control Parts and Installation

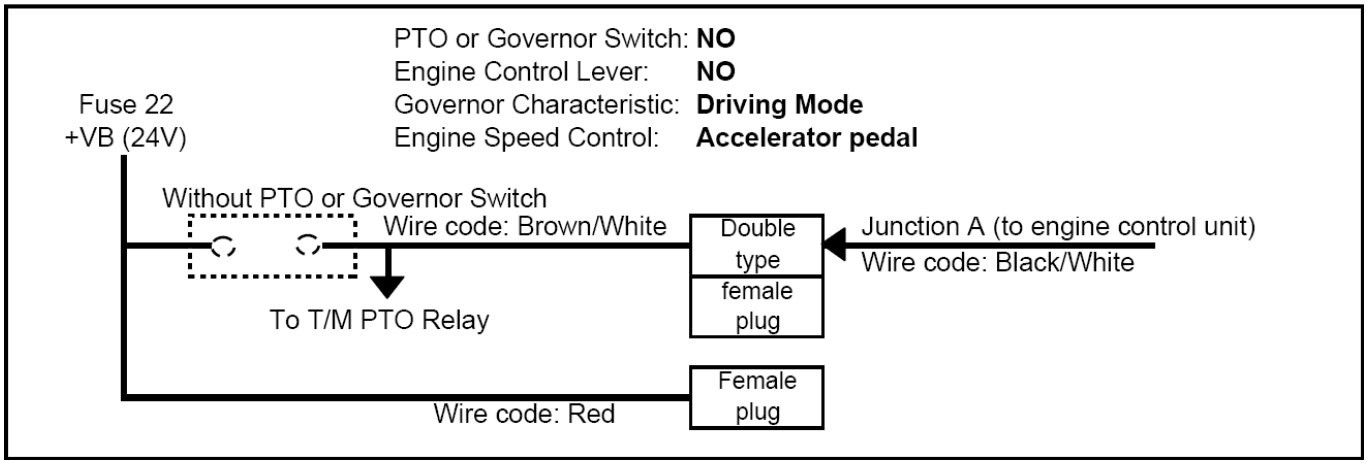
- Junctions A and B...Refer to "item a. Junction Connection Patterns".
- Engine Control Lever ... Refer to "item b. External Engine Control Lever Unit".
- PTO and Governor Switch ... Refer to "item c. PTO and Governor Switch".

Note: Conditions where engine control by the external engine control lever is activated.

- Transmission change lever: Neutral position must be selected.
- Vehicle speed: Vehicle must be stationary.

a. Junction Connection Patterns

Connection Pattern - STANDARD CHASSIS-CAB (ex. NDMC production)



Notes:

1. PTO switch (incorporates both the PTO and governor switching function)....Part No. 25165 02Z00.
2. Governor switch.....Part No. 25165 02Z02.
3. To switch the governor characteristics from **Driving** to **All Speed** mode, the ON or OFF signal of the PTO or Governor switch is required and in addition, the following conditions must be satisfied.
   - Accelerator pedal: Idling position.
   - Engine control lever: Idling position (if fitted).
   - Transmission change lever: Neutral position must be selected.
   - Vehicle speed: Vehicle must be stationary.

   Note: If fitted with a transmission PTO the clutch pedal must be depressed and then released, after operation of the PTO switch, to engage the PTO.
4. When using **ENGINE PTO** connection pattern **2** both the accelerator pedal and external control lever are active, the engine speed is determined according to either the accelerator pedal opening degree or the external engine control lever opening degree, whichever can achieve a higher speed.
5. When fitted with either a PTO or Governor switch, the switch must be in the OFF position before starting the engine. When the switch is in the ON position, the engine **DOES NOT START.**

End of Line Programming (EOLP) Parameters- Accelerator Pedal (active/disabled)

When using **ENGINE PTO** connection patterns **3** and **4** or **TRANSMISSION PTO** connection patterns **2** and **3** and the PTO or Governor switch is turned to the ON position, the **accelerator pedal function is disabled**.

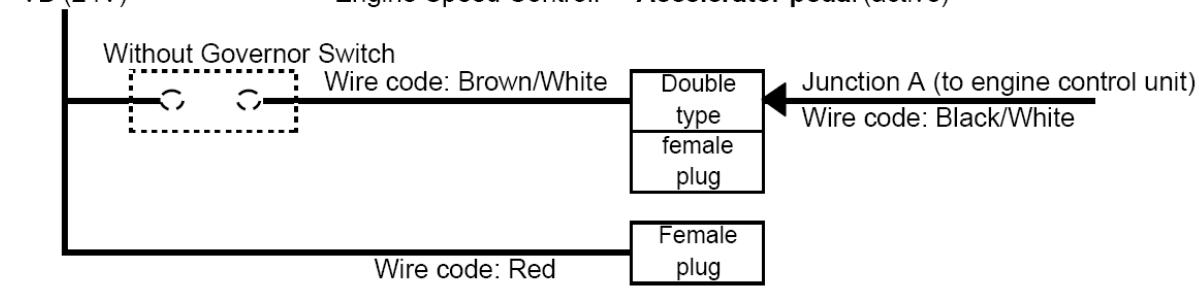
Should the vehicle application require the accelerator pedal function to be **active** when using one of these connection patterns, the engine ECU is re-programmable by UDT, via your UD Trucks dealer, to incorporate the accelerator pedal active function when the PTO or Governor switch is turned to the ON position.

WARNING: Ensure that the PTO or governor switch is turned OFF during driving. If the PTO or governor switch is in the ON position, the governor characteristic is changed to the operation mode (all-speed). Driving under such a status is dangerous.

Connection Pattern - When ENGINE PTO is Installed

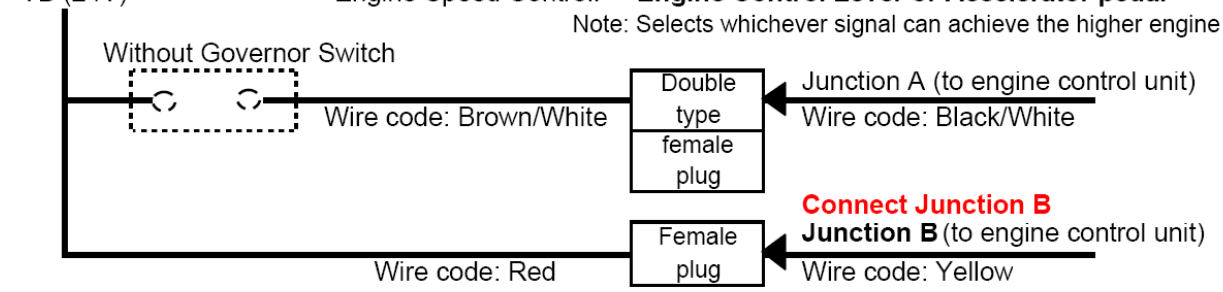
1: ENGINE PTO (Driving Mode)

Governor Switch: **NO**
Engine Control Lever: **NO**
Governor Characteristic: **Driving Mode**
Engine Speed Control: **Accelerator pedal** (active)



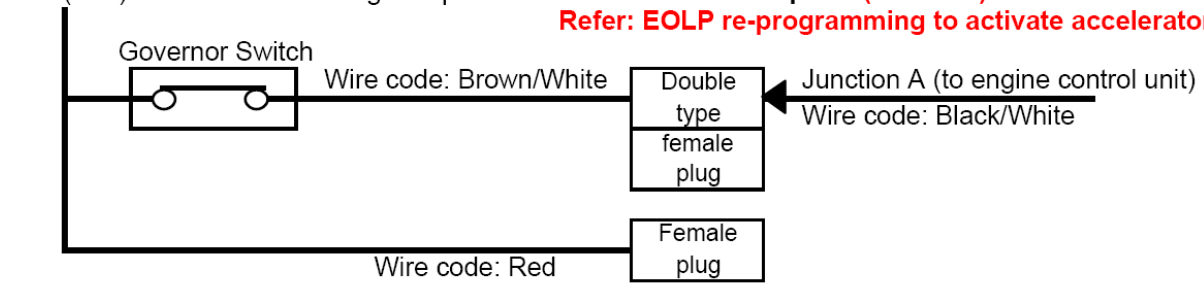
2: ENGINE PTO with EXTERNAL CONTROL LEVER (Driving Mode)

Governor Switch: **NO**
Engine Control Lever: **WITH**
Governor Characteristic: **Driving Mode**
Engine Speed Control: **Engine Control Lever or Accelerator pedal**
Note: Selects whichever signal can achieve the higher engine speed.



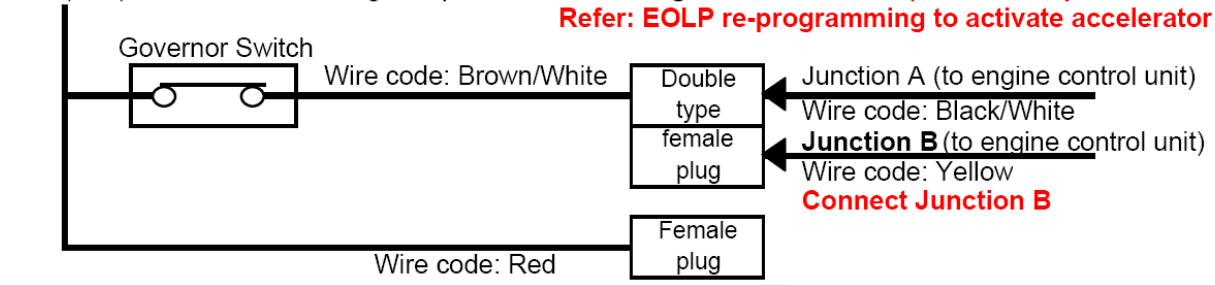
3: ENGINE PTO (All Speed Mode)

Governor Switch: **WITH**
Engine Control Lever: **NO**
Governor Characteristic: **All Speed Mode** (Governor switch ON)
Engine Speed Control: **Accelerator pedal (disabled)**
Refer: EOLP re-programming to activate accelerator pedal.



4: ENGINE PTO with EXTERNAL CONTROL LEVER (All Speed Mode)

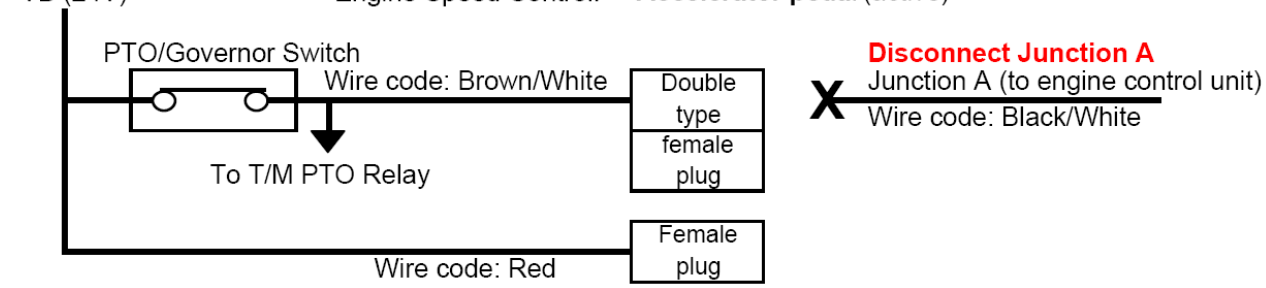
Governor Switch: **WITH**
Engine Control Lever: **WITH**
Governor Characteristic: **All Speed Mode** (Governor switch ON)
Engine Speed Control: **Engine Control Lever (accelerator pedal disabled)**
Refer: EOLP re-programming to activate accelerator pedal.



Connection Pattern - When TRANSMISSION PTO is Installed

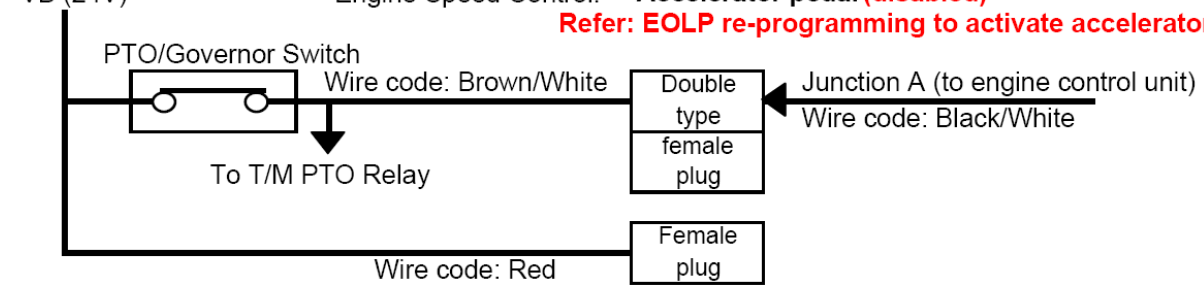
1: T/M PTO (Driving Mode)

PTO/Governor Switch: **WITH**
Engine Control Lever: **NO**
Governor Characteristic: **Driving Mode** (PTO/Governor switch ON)
Engine Speed Control: **Accelerator pedal** (active)



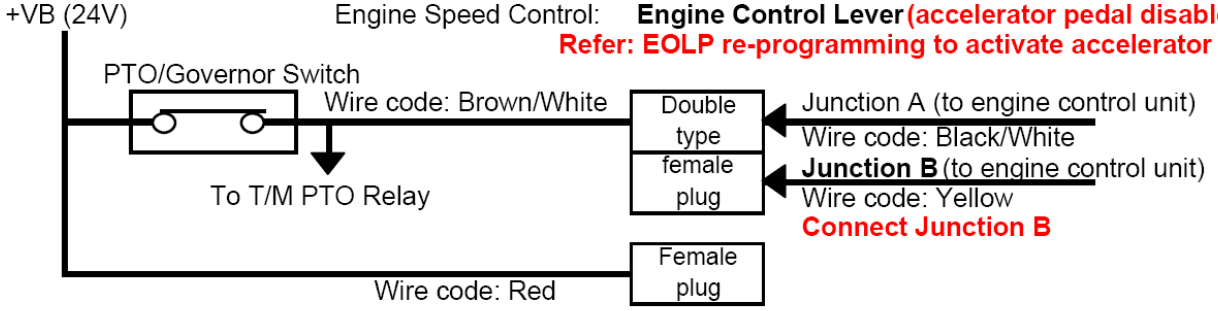
2: T/M PTO (All Speed Mode)

PTO/Governor Switch: **WITH**
Engine Control Lever: **NO**
Governor Characteristic: **All Speed Mode** (PTO/Governor switch ON)
Engine Speed Control: **Accelerator pedal (disabled)**
Refer: EOLP re-programming to activate accelerator pedal.



3: T/M PTO with EXTERNAL CONTROL LEVER (All Speed Mode)

PTO/Governor Switch: **WITH**
Engine Control Lever: **WITH**
Governor Characteristic: **All Speed Mode** (PTO/Governor switch ON)
Engine Speed Control: **Engine Control Lever (accelerator pedal disabled)**
Refer: EOLP re-programming to activate accelerator pedal.



Optional Engine Control Parts Installed During UDTC Production

Engine control parts are supplied in combination as shown in the table below.
To obtain necessary engine control functions, ensure junctions A and B are connected referring to item “a. Junction Connection Patterns”.

Vehicle Specification		PTO Switch Specification	Engine Control Lever	Mounting Bracket	Sub-Harness for Extension	Junction A	Junction B
Chassis-Cab (std)		-	-	-	-	Connected	Disconnected
Options:	Engine Control Lever	Governor only	Supplied	Supplied	Supplied	Connected	Connected
	Engine PTO	-	-	-	-	Connected	Disconnected
	Transmission PTO (GK)	PTO/Governor	-	-	-	Connected	Disconnected

Note: All models feature electrical harness connectors MR-121 PTO switch and E-24 PTO accelerator sensor.

CAUTION - Engine Control Lever: The adjusting bolts mounted at two points on the engine control lever have been set before factory shipment. Do not adjust them.

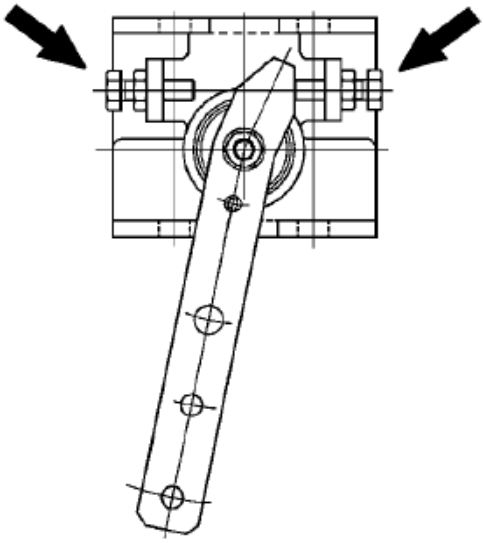


Fig. D Engine Control Lever

b. External Engine Control Lever Unit

1. Specification of control lever
   1) Idle speed: 430~470 rpm
   2) Reaction force of lever
      At idle: 1.02 Nm {0.104 kgf.m}
      At full speed: 2.00 Nm {0.204 kgf.m}
   3) It is recommended that the engine speed, during PTO operation, be set to 1000 rpm or more.

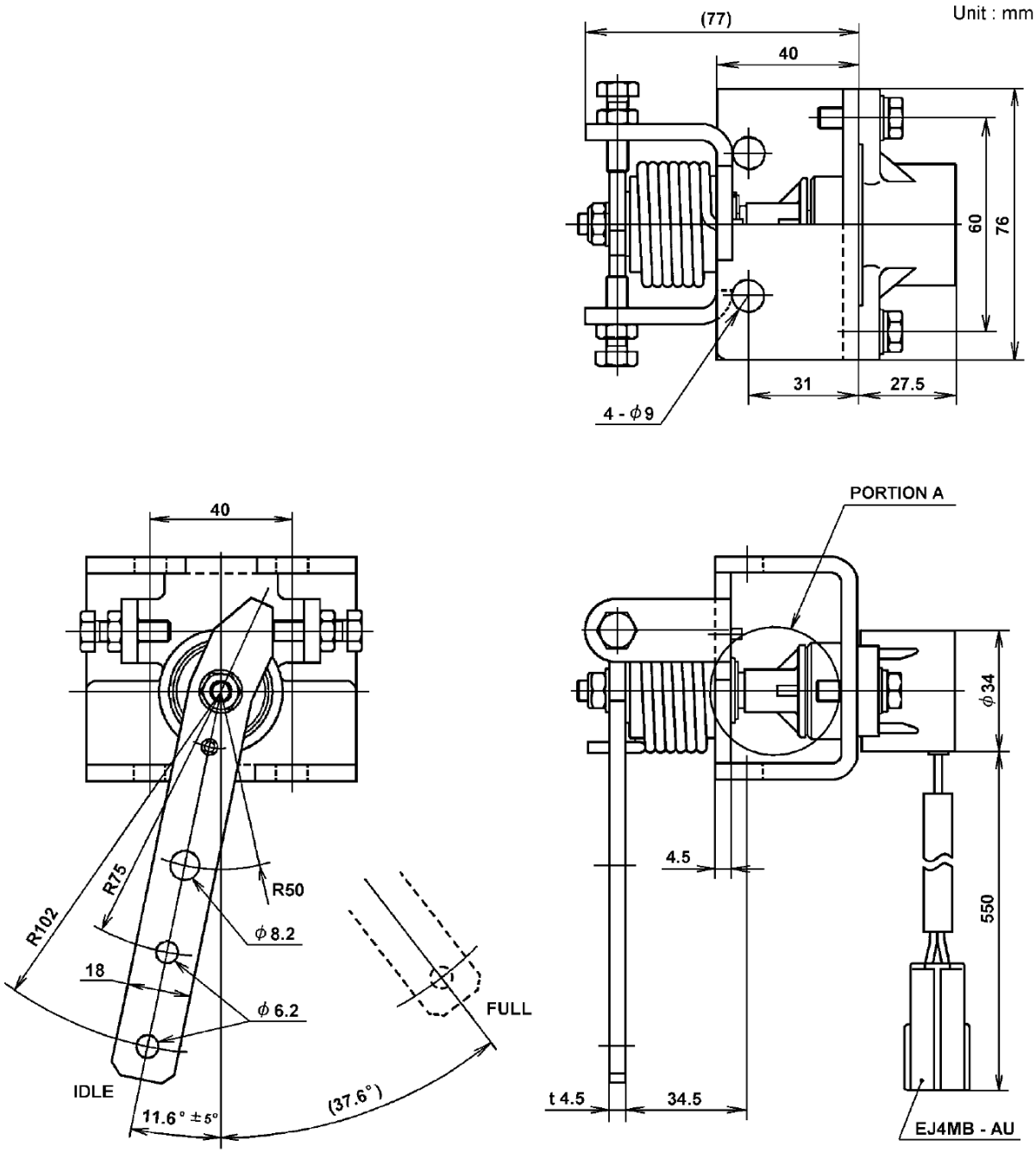


Fig. 1 Engine Control Lever (Part No. 25960 ND00A)

2. Control Lever Installation Procedure
   1) Install the control lever to the recommended position as shown in Figures 4 and 5.
   2) The control wire must be routed and supported by the body manufacturer.
   3) Note:
      - Bracket must be manufactured by the body manufacturer. For detail concerning the control lever installation hole dimensions, refer to Fig. 1.
      - Install the control lever at a position where water is not directly splashed. Especially, in the cases (including car wash) where water is splashed directly on the coupling in the lever (at the portion A in Fig. 1), put a cover on it.
      - Do not install the control lever in the wrong direction as shown in Fig. 2.

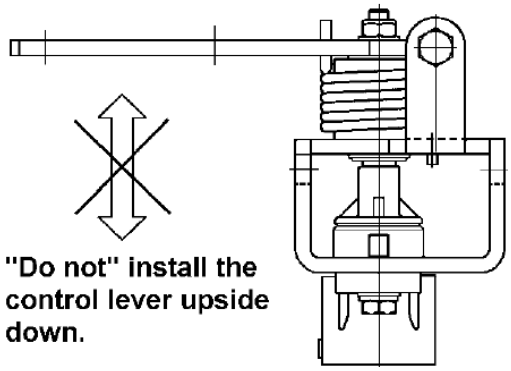


Fig. 2 Installation Direction

      - If the harness cannot be connected for the reason of the installation location of the control lever, use an extension sub-harness (24024 04Z01) or equivalent.
      - According to the “GENERAL PRECAUTIONS ON ELECTRICAL WIRING” in the electrical section of this manual, wire the sub harness and install vibration-proof fasteners where necessary.

   4) The harness is to be connected to the engine harness located at the rear of the cab mount, in the left rear portion of the engine. For detail concerning harness connection, refer to “Fig. 6 Location of engine control lever connector”.
      The connector is equipped with a waterproof cap, and fastened to the engine harness using a binding tape. Before connecting, remove the tape and waterproof cap. (The connector is a 4-pin waterproof type.)

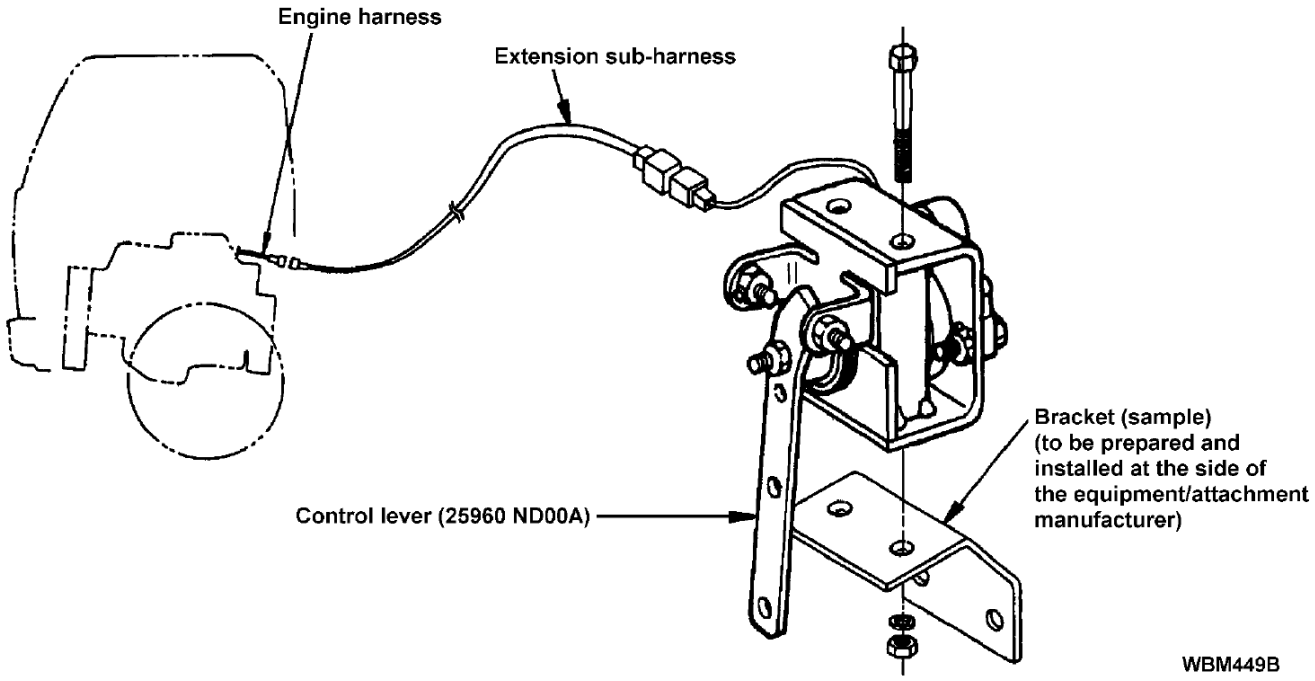


Fig. 3 Installation Procedure

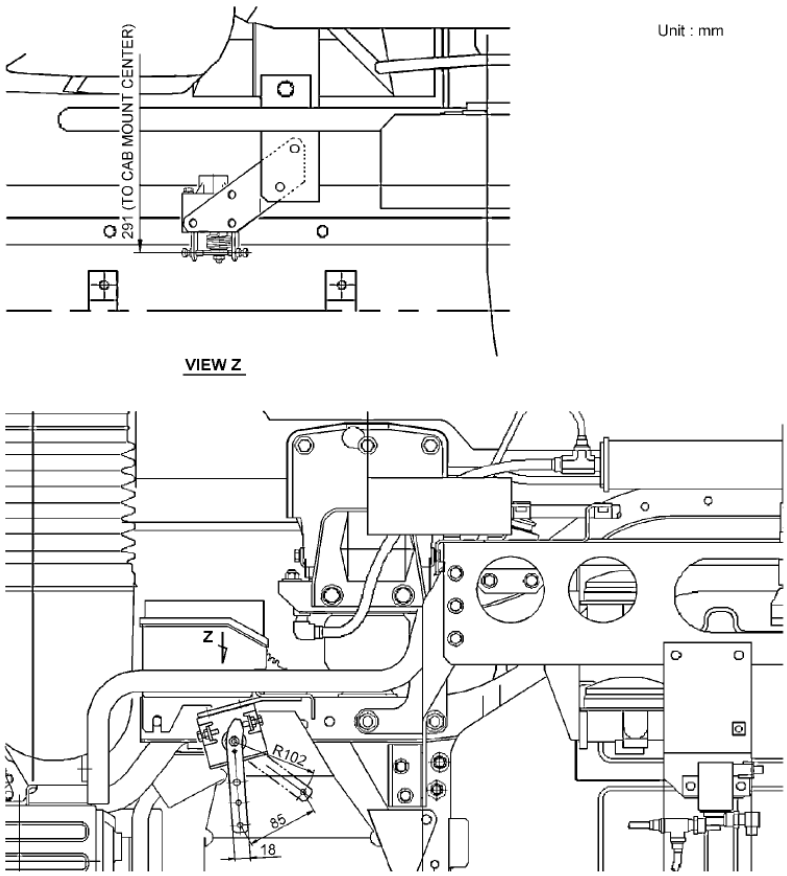


Fig. 4 Engine Control Lever Installation Dimension (GKB, GWB)

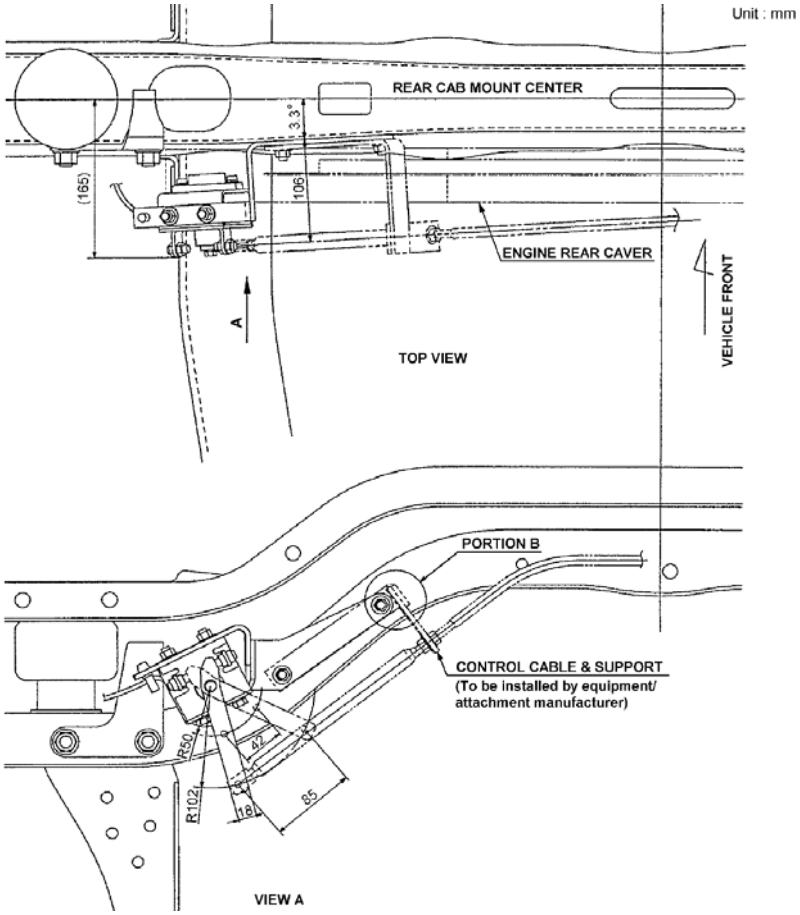


Fig. 5 Engine Control Lever Installation Dimension (CWB)

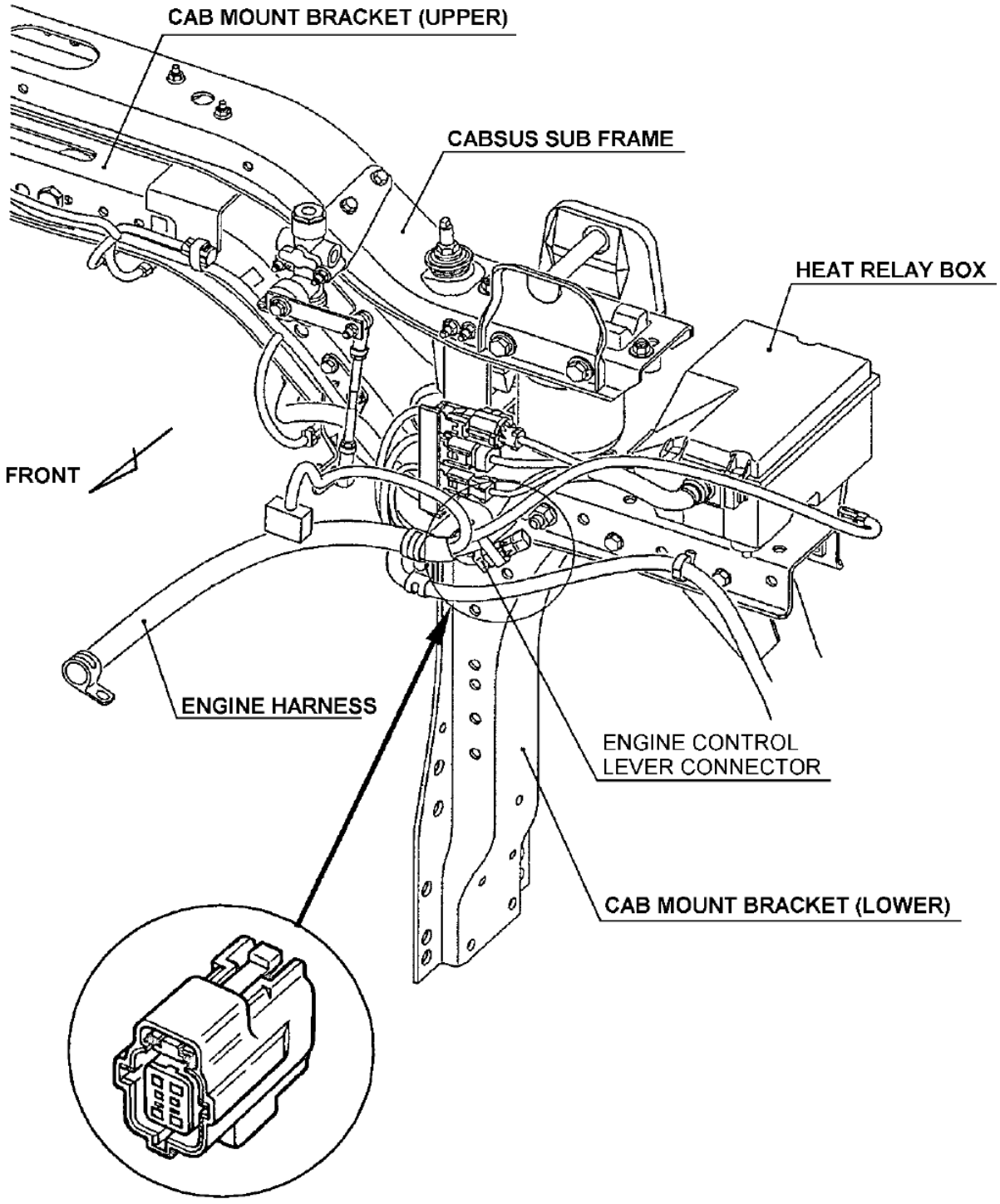


Fig. 6 Location of Engine Control Lever Connector

c. PTO and Governor Switch

If a PTO is added to a vehicle having no PTO switch or if governor switching function is added to a vehicle having no such function, install the switch in the space provided on the instrument panel.

1. Selection of Switch
   There are two kinds of switches (#). Refer to the table below.
2. Sequence of Operation
   1) Pull the instrument cluster surround from the instrument panel to remove it.
   2) Pull the escutcheon (PTO switch) panel from the instrument panel forward to remove it.
   3) Install or replace the switch at the PTO switch installation point on the escutcheon.
   4) The switch connector is connected to the S type 8 pin female connector. The connector has been taped to the harness which branches from the main harness to the escutcheon. Remove the tape and pull out the connector. A label marked “2” is attached to the harness near the connector for identification.
   5) Connect the PTO switch connector with the connector on the main harness side.
   6) Install the escutcheon and instrument cluster surround in the reverse sequence of removal.

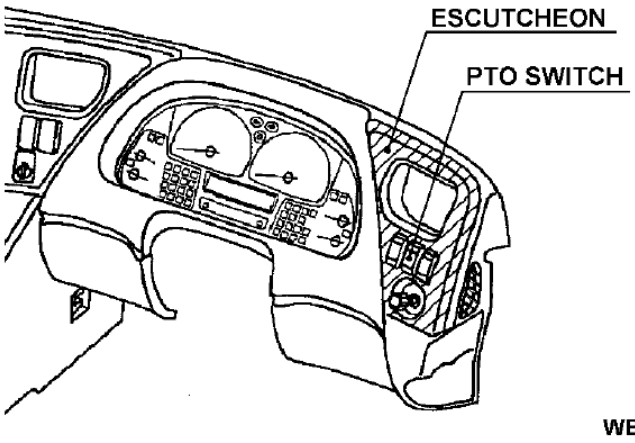


Fig. 7 Instrument Panel

3. Precautions when Starting the Engine
On a vehicle with the PTO or governor switch, be sure to turn the switch to the OFF position before starting the engine. When the switch is in the ON position, the engine DOES NOT START.

d. Parts to be Prepared when the External Control Lever is Retrofitted

Parts required for standard chassis-cab installation:

QTY	Part No.	Part Name	Remarks (Unit: mm)
1	25960 ND00A	Control lever	External Engine Control Lever unit
1	25165 02Z00	Switch	(#) PTO (with Transmission PTO - refer note)
	25165 02Z02	# If required	(#) Governor (with Engine PTO)
1	25614 03Z14	Sensor bracket	For installation of the Engine Control Lever
2	01125 00854	Flange bolt	M8x1.25 L=80, lever and bracket
2	01125 28204	Flange bolt	M8x1.25 L=25, bracket and cab mount
4	08918 3081A	Flange nut	M8x1.25
1	01935 35004	Stay	For installation of the harness clip on the cab mount
1	08117 0201G	Bolt with washer	For installation of the stay on the cab mount
2	01552 30004	Harness clip	Sensor bracket, stay on the cab mount
1	01552 00224	Fastener band	For fixing the harness of the control lever to the engine harness
1	24024 04Z01	Sub-harness	For extended connection (3.5m)

Note: Refer to the “Transmission PTO” section of this manual for the PTO control circuit and the PTO relay, magnetic valve and clutch switch components.

See “HD-T wiring diagrams” in the UDTC Service Manual for detailed information on the electrical system.

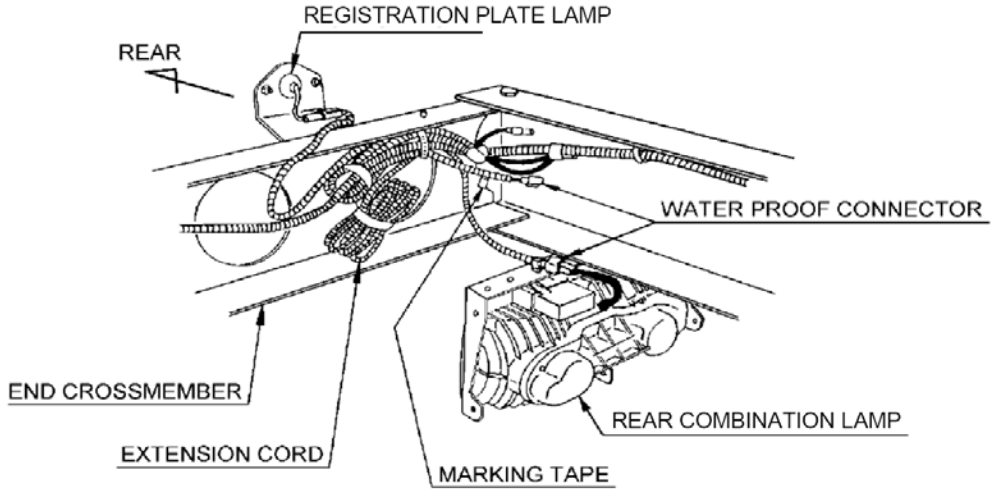
NOTE: For more detailed information on the Autoshift® components refer to the UDT “Autoshift® service manual supplement” Publication number AUS000183

HARNESS FOR REAR LAMPS

Wiring and Installation of Rear Combination and Registration Plate Lamps

Harness for rear combination and registration plate lamps has surplus harness that enable the extension in body installation, and the surplus harness is tied in bundles for shipment as shown in the figure below.
At body installation, lay out the harness without sagging and clipped at intervals of 300mm as a standard (ref. General Precautions on Electrical Wiring). If the remaining harness is tied in a bundle, fix it so that it does not interfere with the brake piping, fuel piping, etc.

Lamps	Temporary Installation Position	Length of Extension Harness	Harness Marking	Applied Models
Rear combination lamp	Rear end of frame	Right: 2.0m	Without	Rigid
		Left: 1.2m	Without	
		Right: 0.5m	Without	Tractor
		Left: 0.5m	Without	
Registration plate lamp	End crossmember	0.8m	Without	All



Position of Rear Combination, Reversing and Registration Plate Lamps

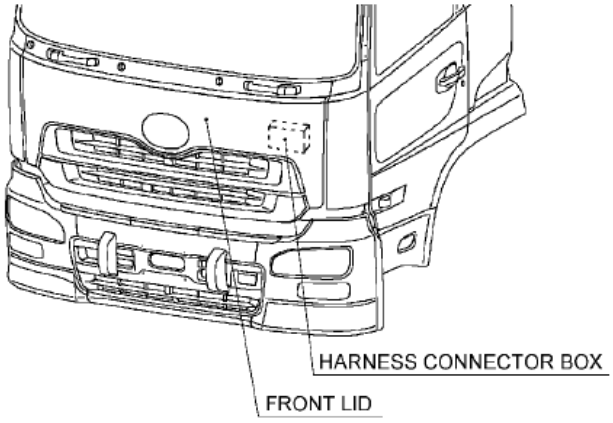
Rear combination, reversing and registration plate lamps, supplied by UDT, all have ADR approval for photometric performance however their location on the completed vehicle must meet the positional requirements of ADR 13/--, refer to the “Guidelines – Legislation” section of this manual.
Ensure that the requirements of Appendix A, clause 5.10.2 of ADR 13/-- are also met when considering the location of the registration plate lamp.

Connection to Spare Circuits in Chassis Harness LH

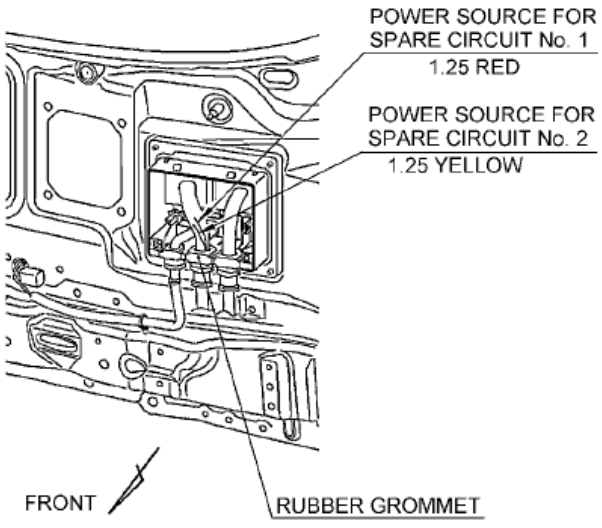
Two parallel spare circuits are built into the chassis harness from the harness connector box of the cab (LHS) to the rear of the LH frame. If these built in circuits are to be connected during body installation, connect to the harness according to the following procedure.

1. When the circuits built into the chassis harness are used:

   Cab Side:
   As shown in the figure, the harness connector box is placed on the left side under the front cab lid and three harness bundles are connected to the harness connector box.



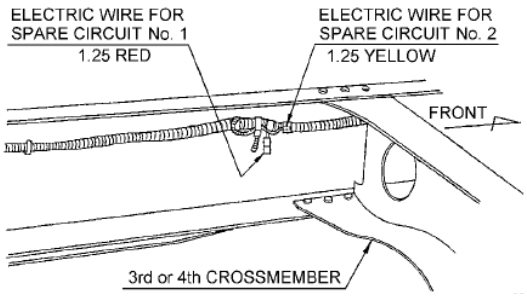
   Next, as shown in the figure below, if the box cover is removed, you will find two electric wires (red and yellow), without connectors, for the spare circuits, attached at the back of the second harness bundle from the right with blue tape.
   Note: Refer to the Harness Layout section, chassis harness LH, illustration key **CL-7 Spare Wire** (cab side).



Location of CL-7: Spare Circuit Wire/s (cab side)

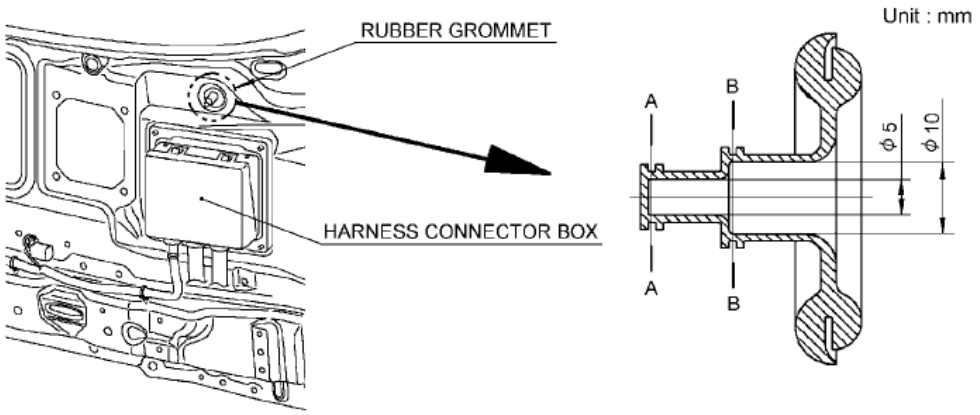
   Chassis Side:
   The electric wires, without connectors, for the spare circuits on the chassis side are attached to the chassis harness LH in the left frame rail and identified with blue tape as shown in the figure below.
   - CWB Series: LH chassis rail at the back of the 3rd or 4th crossmember.
   - GKB/GWB Series: LH chassis rail above the centreline of the rear axle group.

   Note: The same colour wires (red and yellow) are used respectively on the cab side and chassis side, the carrying capacity of each wire is15A and if utilised a fuse must be included in each circuit.
   Refer to the Harness Layout section, chassis harness LH, illustration key **CL-50 Spare Wire** (chassis side).



Location of CL-50: Spare Circuit Wire/s (chassis side)
Note: CWB Series Illustrated (ref. Harness Layout section for GKB/GWB Series)

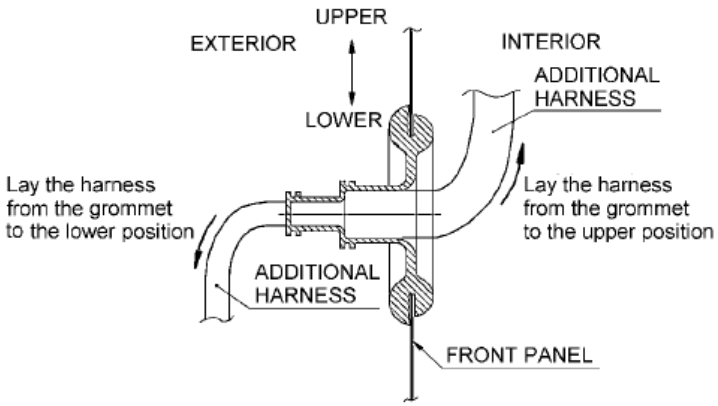
2. When an additional harness is passed through the cab rubber grommet **(Not available on automated models)**:
   The grommet for body installation is set on the upper portion of the cab harness connector box on the left.
   Note: On vehicles fitted with Autoshift ® AMT this rubber grommet is not available for use (it is used for the AMT harness).



The harness can be passed through the grommet by cutting either the cross section A-A (max. diameter of 7mm) or B-B (max. diameter of 13mm) of the rubber grommet, one of two sizes can be selected depending on the size of the additional harness.

CAUTION

- **When re-installing the grommet or passing a harness through the grommet, seal and install it tightly to prevent water or drafts from entering.**
- **To prevent water entry, install the harness from the grommet to the upper position on the interior side and from the grommet to the lower position on the exterior side.**

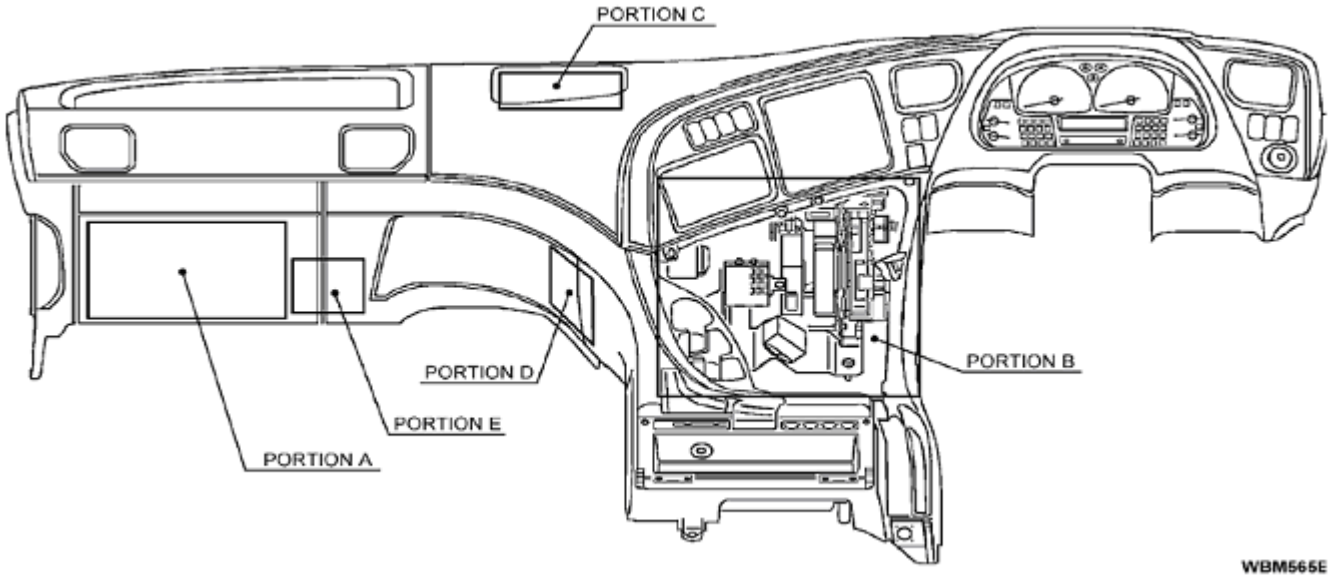


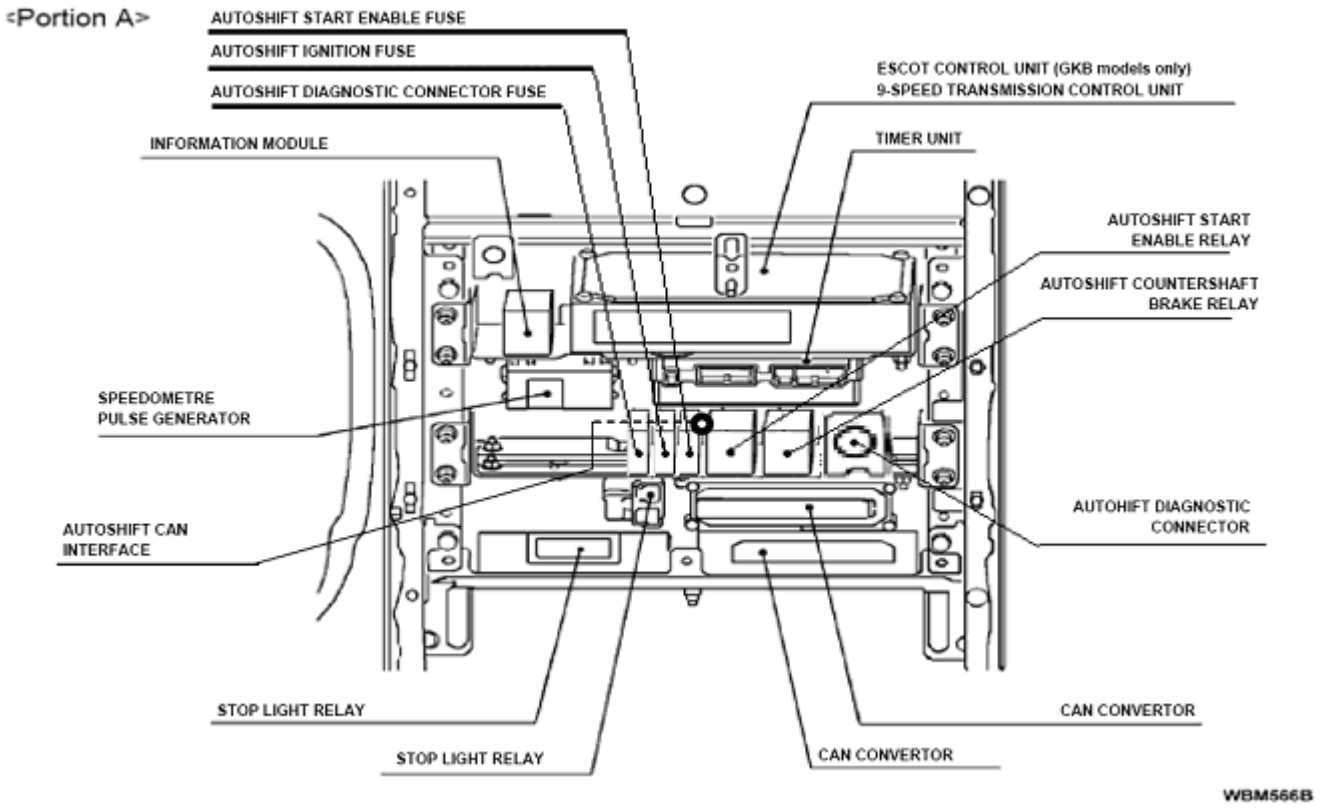
WARNING: These spare circuits (red and yellow wires) are NOT protected by a fuse. If these spare circuits are used they MUST be fused individually with fuses having a maximum rating of 15A. Refer the following Electrical System sections, in this manual, for potential sources of additional electrical power, if required.

LOCATION OF FUSE BOX, RELAY AND OTHER UNITS IN THE CAB

The fuse box, relay and units in the cab are located as shown in the figure below.

CAUTION: When welding, strictly observe the "Precautions during electric welding" instructions in the "Guidelines – Body Installation" section of this manual.

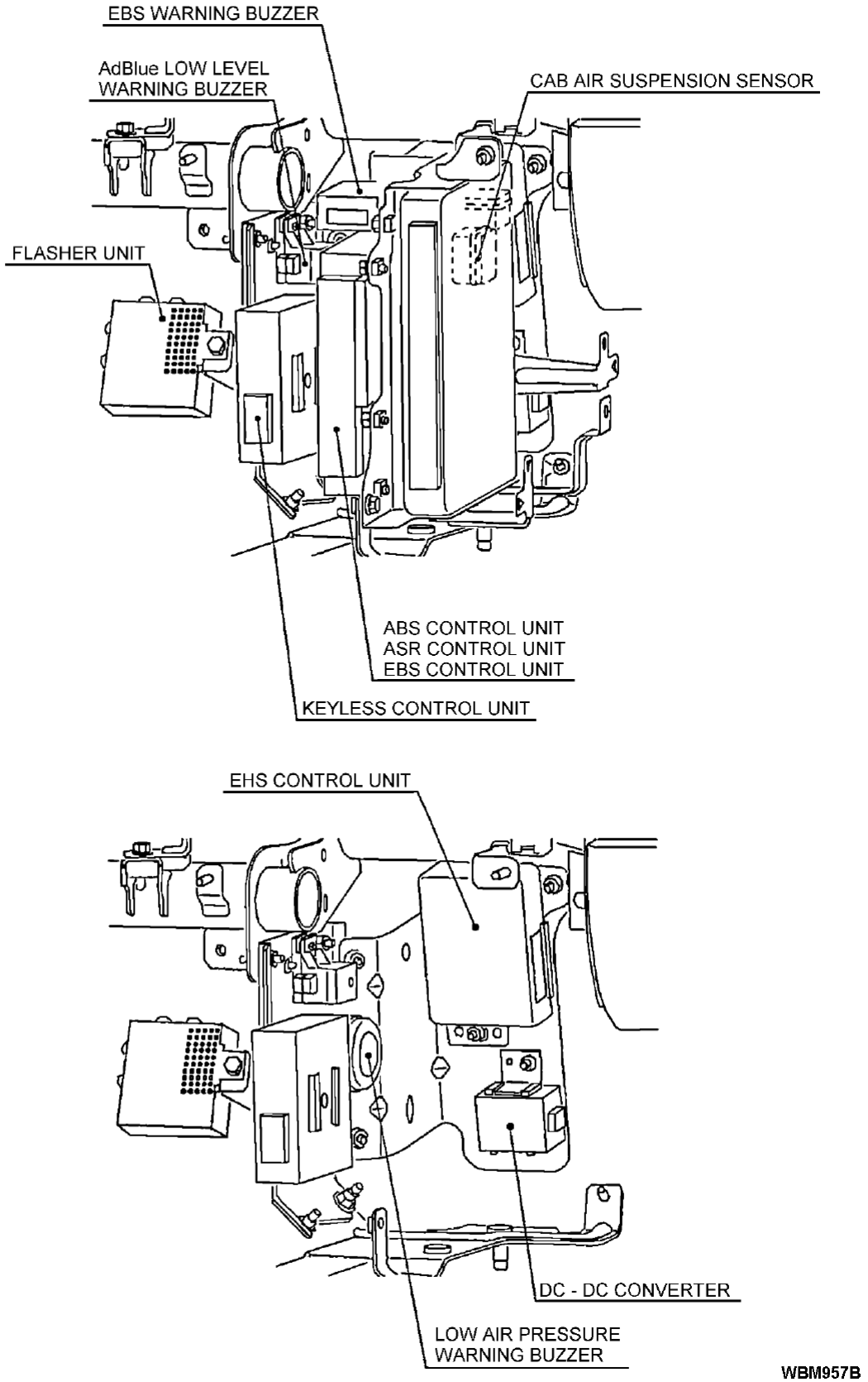




Location of Various Electrical Units Inside the Dash Cover on the Passenger Side

NOTE: For more information on the Autoshift® components refer to the UDT "Autoshift® service manual supplement" Publication number AUS000183

<Portion B>

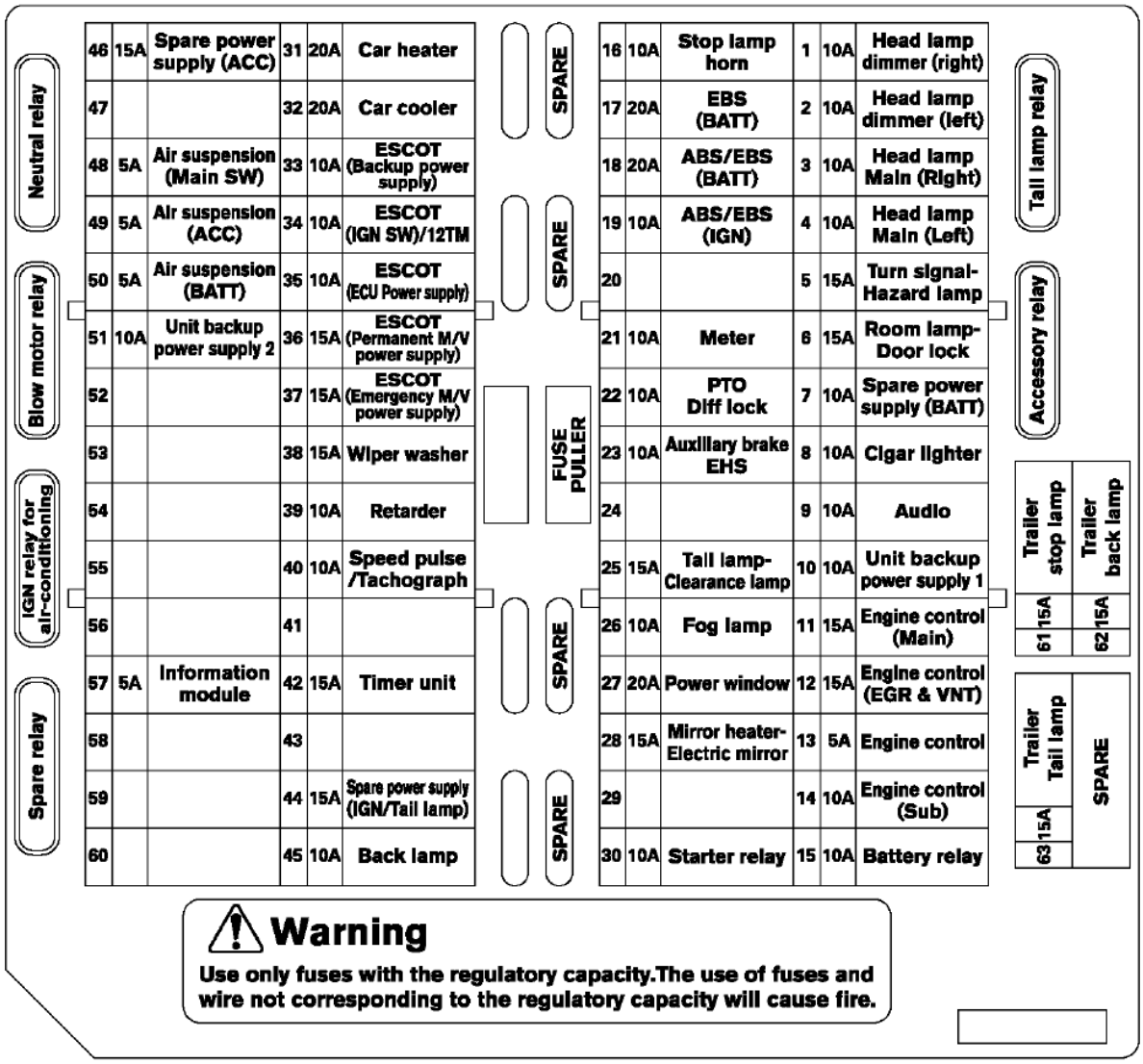


Location of Various Electrical Units Inside the Dash Cover on the Centre Console

<Portion C>

- Layout of the fuse box in the cab
  Blade type fuses and relays are placed as shown in the figure and table below; depending on the vehicle specification.

GKB, CWB and GWB Series



WBM046C

Chart: Fuse and Relay Installation – By Model

No.	Fuses GKB	CWB	GWB	No.	Fuses GKB	CWB	GWB	No.	Fuses GKB	CWB	GWB	No.	Fuses GKB	CWB	GWB	No.	Fuses GKB	CWB	GWB
46	■	■	■	31	■	■	■	16	■	■	■	1	■	■	■	61	■	■	■
45				32	■	■	■	17	■		■	2	■	■	■	62	■	■	■
48	■		■	33	■			18	■	■	■	3	■	■	■	63	■	■	■
49	■	■		34	■			19	■	■	■	4	■	■	■				
50		■		35	■			20				5	■	■	■				
51	■	■	■	36	■			21	■	■	■	6	■	■	■				
52				37	■			22	■	■	■	7	■	■	■				
53				38	■	■	■	23	■	■	■	8	■	■	■				
54				39				24				9	■	■	■				
55				40	■	■	■	25	■	■	■	10	■	■	■	Name	Relays GKB	CWB	GWB
56				41				26	■	■	■	11	■	■	■	Neutral	■	■	■
57	■	■	■	42	■			27	■	■	■	12	■	■	■	Blower	■	■	■
58				43				28	■	■	■	13	■	■	■	Ign & A/C	■	■	■
59				44	■	■	■	29				14	■	■	■	Tail Lamp	■	■	■
60				45	■	■	■	30	■	■	■	15	■	■	■	Accessory	■	■	■

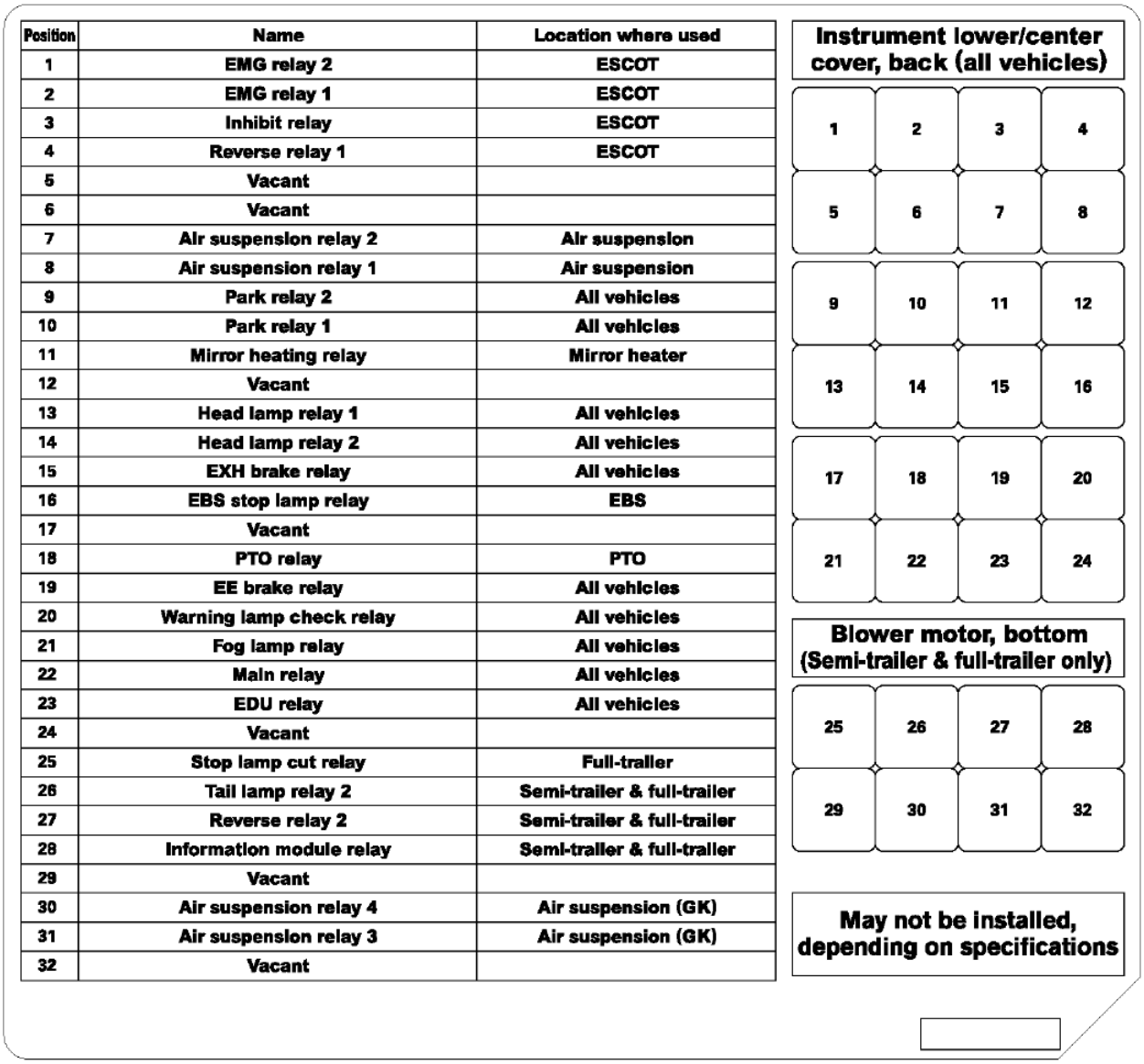
■ Installed

<Portion D (relay: 1-24), Portion E (relay: 25-32)>

- Identification of relays and application
  Relays are placed as shown in the figure and table below; depending on the vehicle specification.

GKB, CWB and GWB Series

Position	Name	Location where used
1	EMG relay 2	ESCOT
2	EMG relay 1	ESCOT
3	Inhibit relay	ESCOT
4	Reverse relay 1	ESCOT
5	Vacant	
6	Vacant	
7	Air suspension relay 2	Air suspension
8	Air suspension relay 1	Air suspension
9	Park relay 2	All vehicles
10	Park relay 1	All vehicles
11	Mirror heating relay	Mirror heater
12	Vacant	
13	Head lamp relay 1	All vehicles
14	Head lamp relay 2	All vehicles
15	EXH brake relay	All vehicles
16	EBS stop lamp relay	EBS
17	Vacant	
18	PTO relay	PTO
19	EE brake relay	All vehicles
20	Warning lamp check relay	All vehicles
21	Fog lamp relay	All vehicles
22	Main relay	All vehicles
23	EDU relay	All vehicles
24	Vacant	
25	Stop lamp cut relay	Full-trailer
26	Tail lamp relay 2	Semi-trailer & full-trailer
27	Reverse relay 2	Semi-trailer & full-trailer
28	Information module relay	Semi-trailer & full-trailer
29	Vacant	
30	Air suspension relay 4	Air suspension (GK)
31	Air suspension relay 3	Air suspension (GK)
32	Vacant	



WBM047C

Chart: Relay Installation – By Model

No.	Relay GKB	CWB	GWB	No.	Relay GKB	CWB	GWB	No.	Relay GKB	CWB	GWB	No.	Relay GKB	CWB	GWB
1	■		N/P	2	■		N/P	3	■		N/P	4	■		N/P
5				6				7	■	■		8	■	■	
9	■	■	■	10	■	■	■	11	■	■	■	12			
13	■	■	■	14	■	■	■	15	■	■	■	16	■		■
17				18	C			19	■	■	■	20	■	■	■
21	■	■	■	22	■	■	■	23	■	■	■	24			
25		■		26	■	■	■	27	■	■	■	28	■	■	■
29				30	■			31	■			32			

■ Installed
C Connecter provided (18 PTO Relay)
N/P No Provision (No. 1~8)

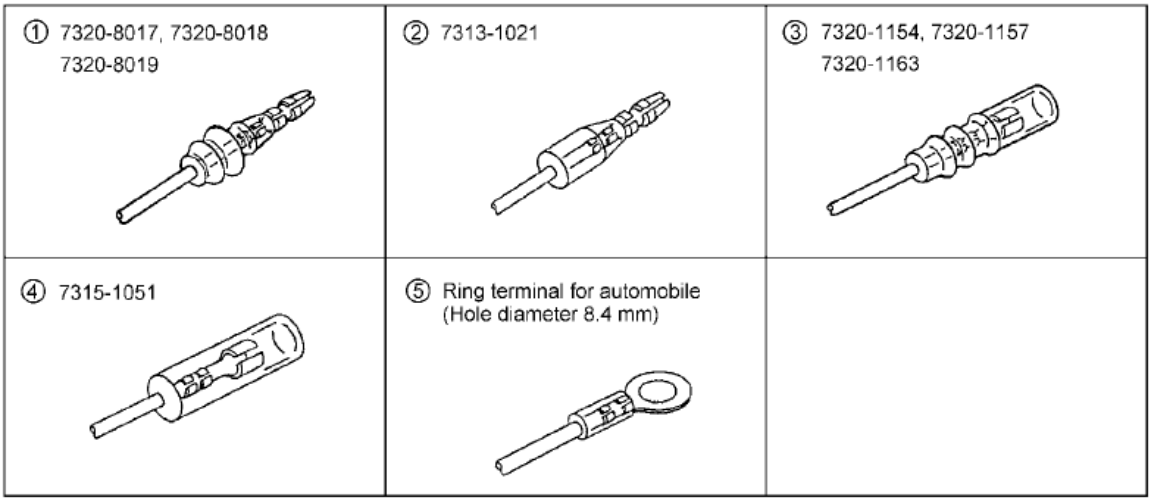
USING THE ADDITIONAL POWER SOURCES

Available additional power sources and their respective terminals are listed in the following table. The available additional power sources vary depending on the vehicle model. Check the applied model for availability.

Item No.	Additional power source item	Location of the terminal for the power source		Maximum output capacity	Terminal No. for the power source (Product No. of Yazaki Corporation)				Applied models
					Terminal on the chassis side (Accessory No.)	Shape	Terminal for connection (prepared by the body manufacturer)	Shape	
1	Additional power source directly connected to the battery	Inside the right frame near the side of the battery		200W [1]	7320-1157	3	7320-8018	1	All
2	Additional power source in the cab	Upper portion of the control unit on the passenger side	Direct to BAT	200W [1 & 2]	7315-1051	4	7313-1021	2	All
			ACC	140W [1]					
			IGN	200W [2]					
	High output to Cargo bed		C	28A					
3	Other (1)	Battery relay		-	Battery relay terminal M8x1.25 (nut)		Ring terminal for automobile (Hole diameter 8.4mm)	5	All
	Other (2)	Battery terminal		-	Battery terminal M8x1.25 (nut)				

NOTES:

- **The Items Nos. in the above table correspond to the Item Nos. detailed in the following procedures.**
- **For Item No. 1 and 2, be sure to follow the "Table 1: Additional power source output capacity" of this section.**
- **The part No. indicated in the column for "Terminal for connection" is the Yazaki Corporation part No. that is recommended for use when the body manufacturer uses these power sources.**
- **The shapes of connectors are as shown in the figure below.**



Item	Additional power source item	Location of terminal for the power source		Maximum output capacity
1	Additional power source directly connected to the battery	Inside the right frame near the side of the battery		200W [1]
2	Additional power source in the cab	Upper portion of the control unit on the passenger side	1. BAT	200W [1&2]
			2. ACC	140W [1]
			3. IGN	200W [2]
			5. C	28A max.

Table 1: Additional Power Source Output Capacity

CAUTION:

[1] The total load drawn from the power sources marked # should be less than the nominated capacity as the fuse is shared with other electrical circuits.

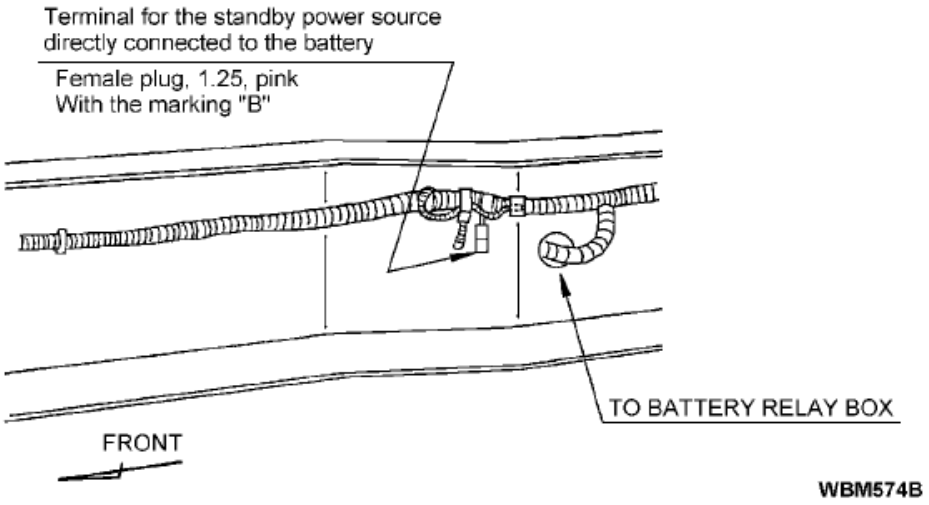
[2] Power output on this circuit is limited to max 50W on all Autoshift® models.

Item 1. Additional Power Source Directly Connected to the Battery

The terminal for the additional live power source that is directly connected to the battery is attached to the chassis harness RH located around the side of the battery inside the right frame rail with blue tape (all vehicles). Use this terminal for a revolving warning light, a cargo bed interior light, etc.

- Output Capacity: Refer to “Table 1: Additional Power Source Output Capacity” in this section.
- Fuse: This circuit is fused using a 10A fuse inside the cab (fuse No. 7).

Note: Refer to the Harness Layout section, chassis harness RH, illustration key **CR-14 Option (BATT)**.

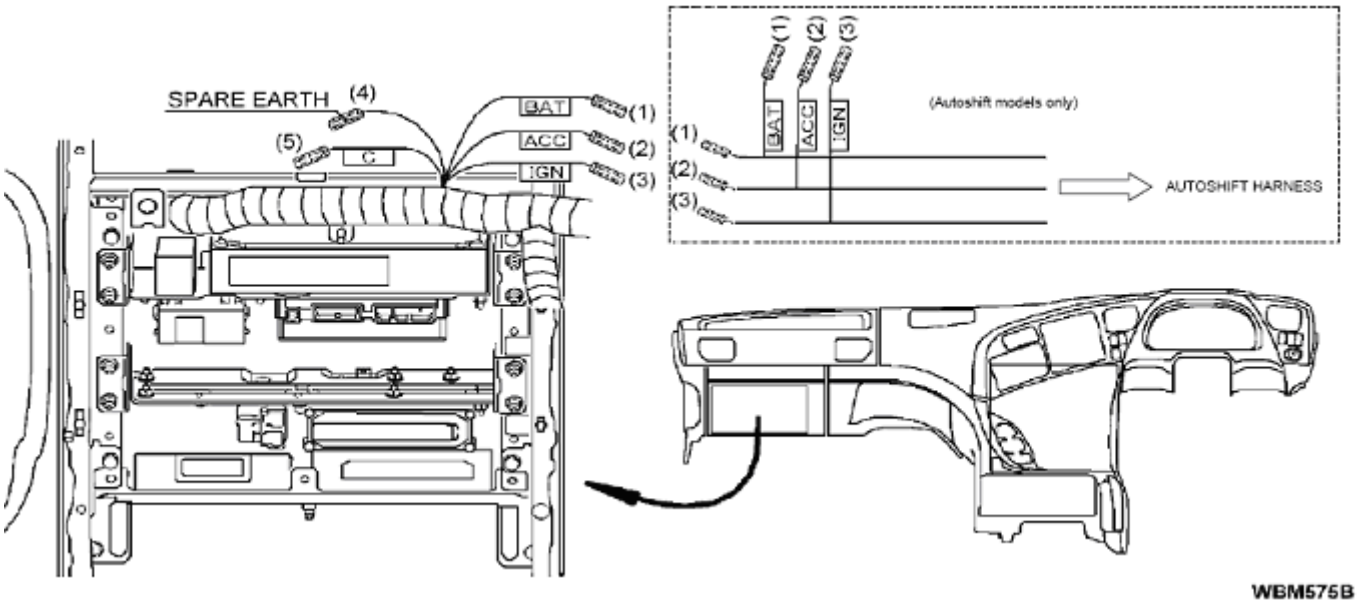

Terminal for the standby power source directly connected to the battery
Female plug, 1.25, pink
With the marking "B"
TO BATTERY RELAY BOX
FRONT
WBM574B

Location of Terminal CR-14: Additional Power Source Directly Connected to the Battery

Note: CWB Series Illustrated (ref. Harness Layout section for GKB/GWB Series)

Item 2. Additional Power Source in the Cab

The terminals for taking out the additional power source in the cab, in series, are provided on the passenger side. (near additional ECU's - all vehicles).



Additional Power Source in the Dash Cover on the Passenger Side

1) **BAT:** For additional live power source directly connected to the battery
- Terminal: Female plug, 1.25, pink, Marking: with BAT.
- Output Capacity: Refer to "Table 1: Additional Power Source Output Capacity" in this section.
- Fuse: This circuit is fused using a 10A fuse inside the cab (fuse No. 7).

Note: Refer to the Harness Layout section, main harness LH, illustration key **ML-40 Option (BATT)**.

2) **ACC:** For additional power source of accessory
- Terminal: Female plug, 1.25, red, Marking: with ACC.
- Output Capacity: Refer to "Table 1: Additional Power Source Output Capacity" in this section.
- Actuation: Turned ON by turning the ignition switch to the ACC position.
- Fuse: This circuit is fused using a 15A fuse inside the cab (fuse No. 46).

Note: Refer to the Harness Layout section, main harness LH, illustration key **ML-41 Option (ACC)**.

3) **IGN:** For additional power source from the ignition circuit
- Terminal: Female plug, 1.25, black and white, Marking: with IGN.
- Output Capacity: Refer to "Table 1: Additional Power Source Output Capacity" in this section.
- Actuation: Turned ON by turning the ignition switch to the IGN position.
- Fuse: This circuit is fused using a 15A fuse inside the cab (fuse No. 44).

Note: Refer to the Harness Layout section, main harness LH, illustration key **ML-42 Option (IGN)**.

4) **Grounding** (Earth)
- Terminal: Plug, 1.25, black, no marking.

Note: Refer to the Harness Layout section, main harness LH, illustration key **ML-43 Option (Earth)**.

5) **C:** For additional "HIGH OUTPUT" live power source directly connected to the battery
- Terminal: Female plug, 2.0, red, Marking: with C.
- Output Capacity: Refer to "Table 1: Additional Power Source Output Capacity" in this section.
- Fuse: Use of fusible link, 40A, (electrical tilt).

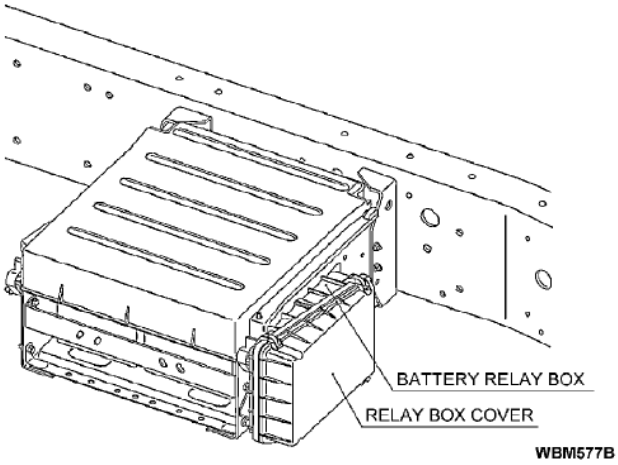
Note: Refer to the Harness Layout section, main harness LH, illustration key **ML-39 Spare 5**.

Item 3. Using Power from Additional Power Sources

1) Additional power from the battery relay box

Power source can be taken from the battery relay terminal in the battery relay box.

- Output: 20A (Atmosphere temperature: 60°C or less).
- Caution: Be sure to install a fuse on the power source side.
- Terminal: Use the ring terminal for automobile with a hole diameter of 8.4mm.
- Harness: Use the electric wire with the cross section area of the harness of 2mm^2.
- Actuation: Turned ON by turning the ignition switch to the ON position.

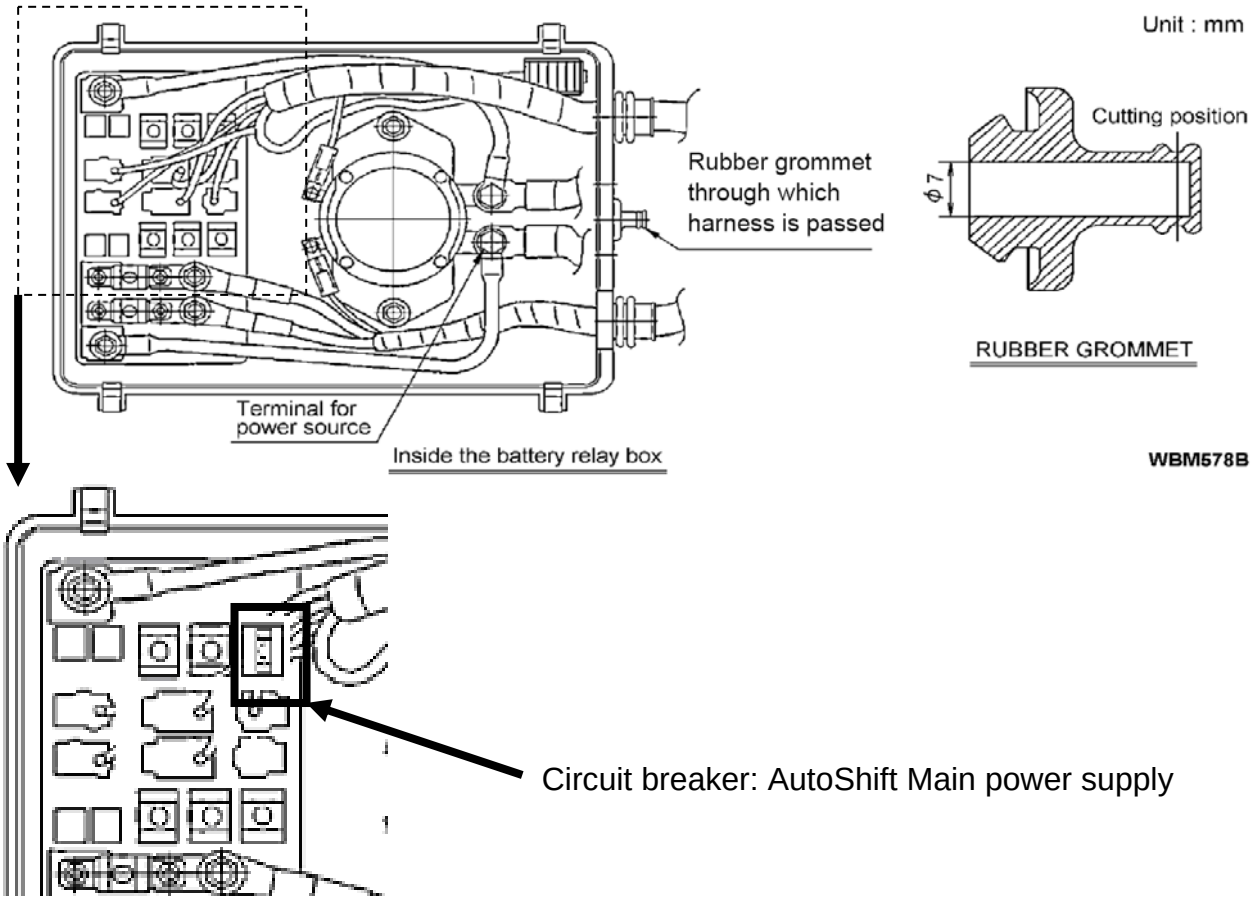


Battery Relay Box Mounting Location

By cutting the protruded portion of the rubber grommet attached to the side of the battery relay box, additional harness can be passed through the grommet.

Note: On vehicles fitted with Autoshift ® AMT this rubber grommet is not available for use (it is used for the AMT harness).

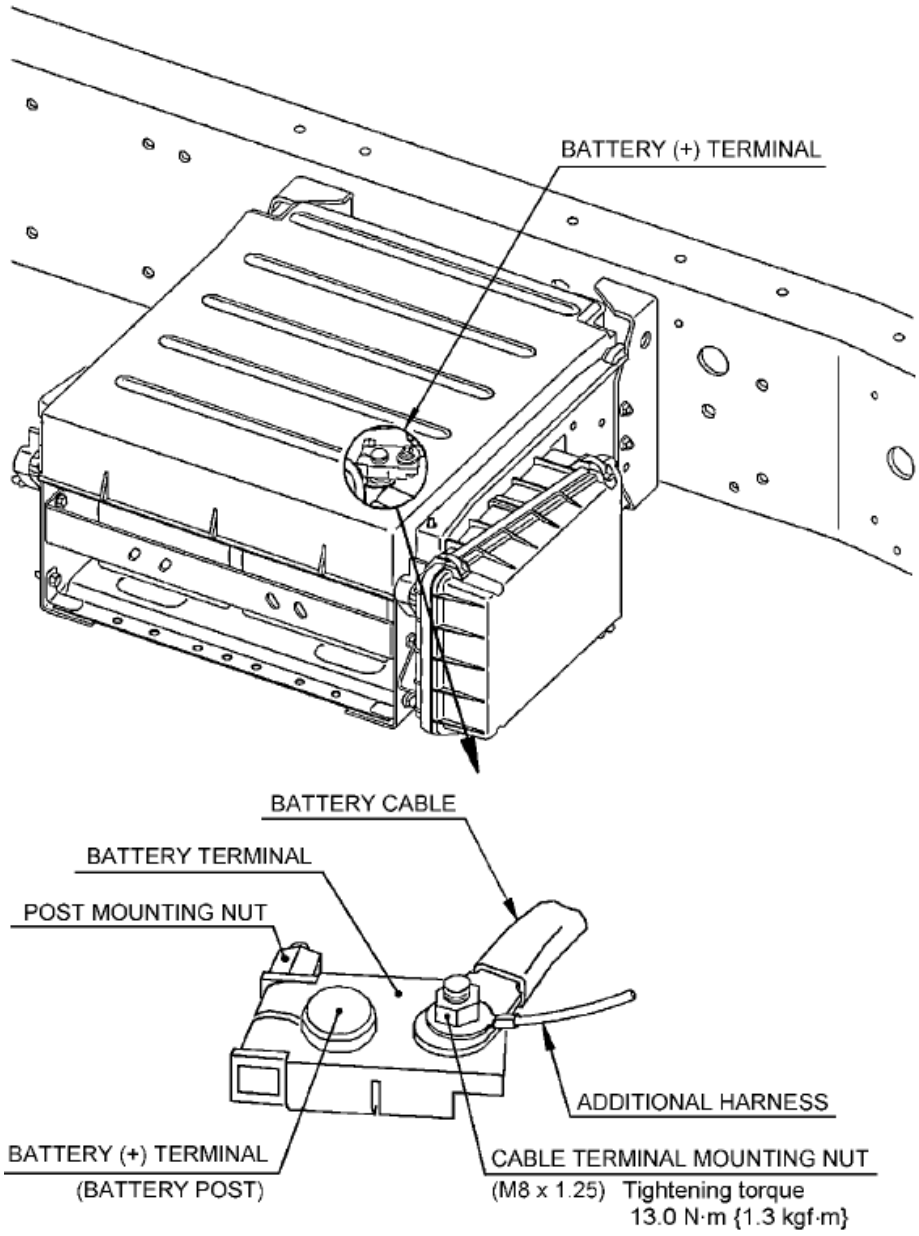
CAUTION: After cutting the protruded portion of the rubber grommet, apply a sealing process for waterproofing.



2) Additional power directly connected the battery

If power source is taken directly from the battery, connect the battery cable together with the additional harness terminal using the existing fixing nut as shown below.

CAUTION: An in-line fuse of appropriate capacity MUST be installed.



GENERAL PRECAUTIONS ON ELECTRICAL WIRING

1. When installing the harness, do not install a harness connector at any place that may be exposed to water or dirt. If a connector is installed unavoidably at such a place, use a water-proof connector or protect the connector with a cover. Install the harness at places where the harness will not be damaged by the accumulation of water, dust, dirt, snow, etc., freeze, or flying stones.
2. To prevent disconnection due to vibration, fix the harness connectors and harness body securely with clip bands or vinyl coated clips as shown in Fig. 1.

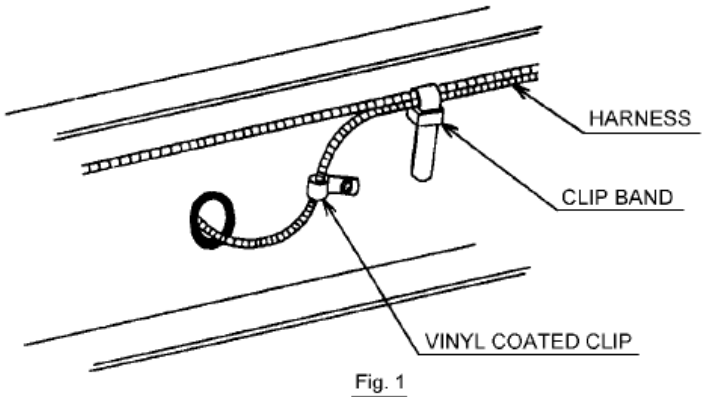


Fig. 1

3. If a harness is installed across the edges of the frame, cab, body, other components etc., protect the harness by winding corrugated tubes around the harness or installing protectors at the edges. If the portion where the harness and the edge are in contact makes relative motion, protect the harness using both methods A and B.

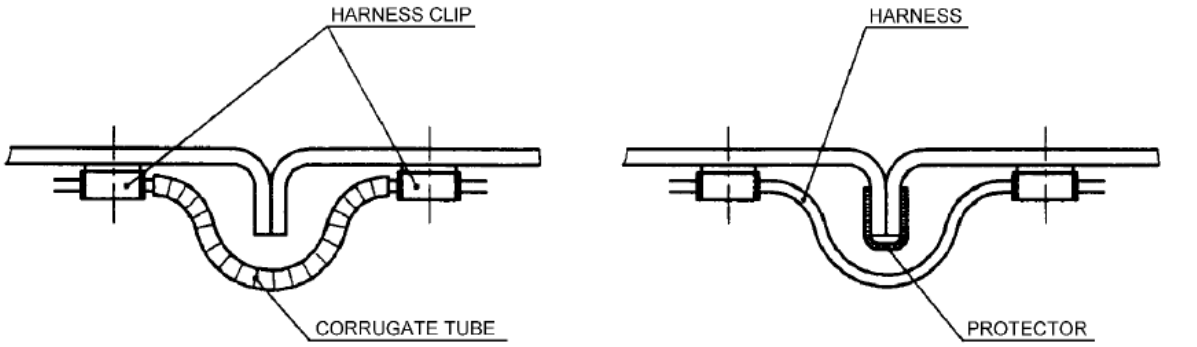


Fig. 2 WBM582B

4. If the plug is used for connection of harness, the female connector should be used on the power source side to prevent shorting to earth when the plug is disconnected.
5. When the harness passes through the hole of a thin metal plate, use a grommet to protect the harness.

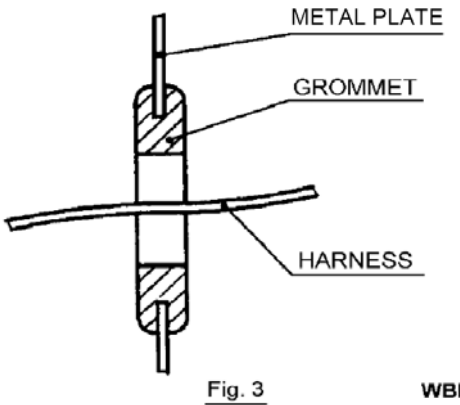


Fig. 3 WBM583B

6. When laying the harness to electrical parts such as lights, install the harness at a lower position than the electrical unit to prevent rainwater from entering the unit along the surface of the harness.

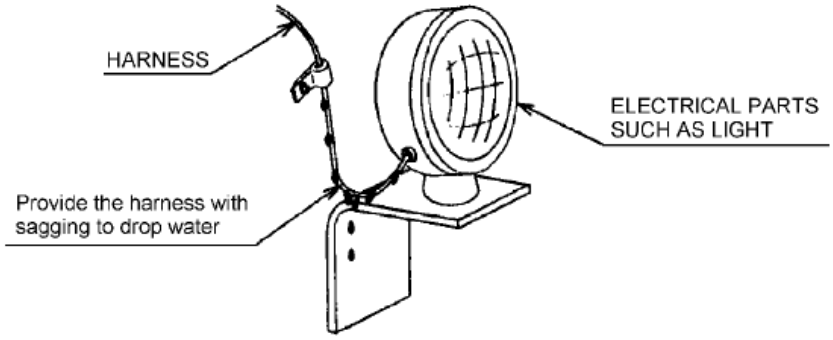


Fig. 4

7. If the harness is installed in a place where relative movement, vibration, etc. occurs (between the cab and frame or between the engine and vehicle body, for example), adjust the length of the harness appropriately to prevent the harness from being pulled or caught in.
8. Keep the harness and connector over 200mm away from any heat source so that the temperature of the wires does not exceed the allowable temperature of 60°C. If it is impossible to secure a sufficient clearance, provide an insulated shield between the harness and heat source.

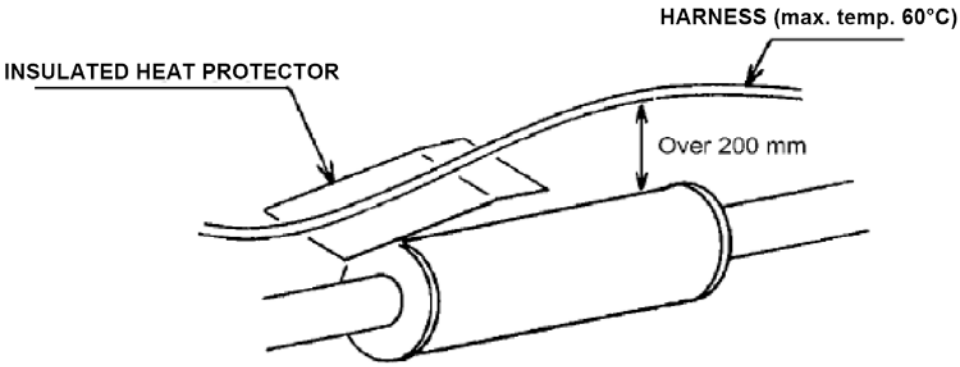
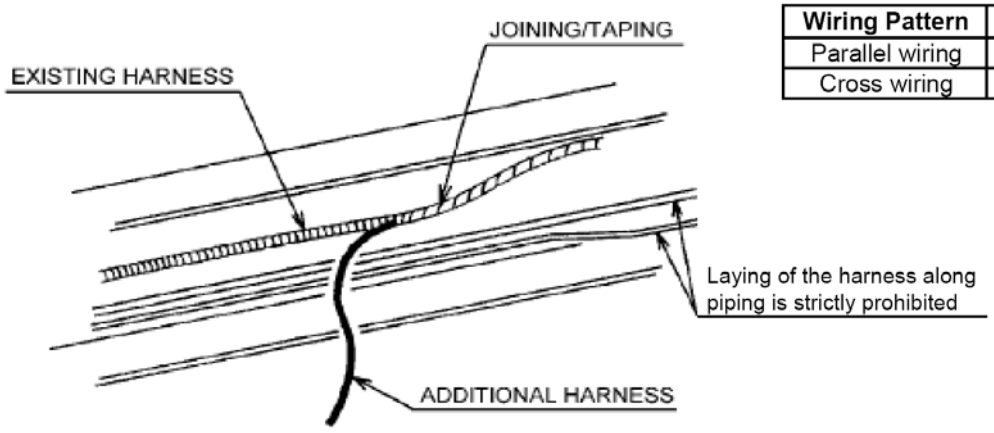


Fig. 5

9. When installing an additional wire, and there is an existing harness in the vicinity of the wiring route, tape or cable tie that additional harness along the existing harness. Do not lay the harness along any piping such as the brake piping, fuel piping, etc. (of any pipe material such as steel tube, rubber hose, vinyl hose, etc.).
Provide the specified clearance between the pipes and harness as shown in the figure below.



Wiring Pattern	Clearance
Parallel wiring	Over 10mm
Cross wiring	Over 20mm

Fig. 6

10. A single harness must be clipped at intervals of 300mm as a standard.

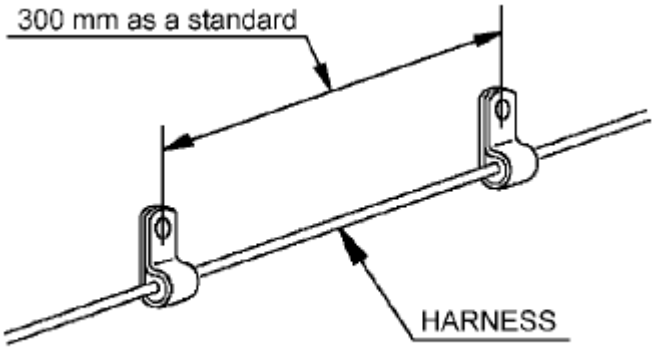


Fig. 7

11. When extending a harness, use a wire which has the same conductor and insulator size, colour, etc. Secure the conductor connection by crimp connection or soldering and apply a complete insulation coating to the connection using a heat-shrinkable tape with adhesive. When connecting harness outside the cab, be sure to waterproof and insulate the connection.

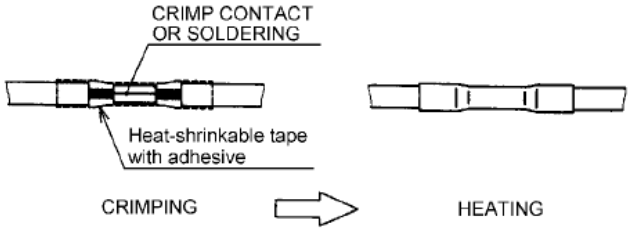


Fig. 8

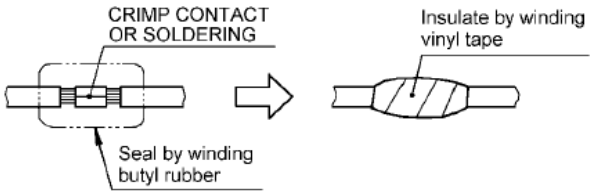


Fig. 9

WBM588B

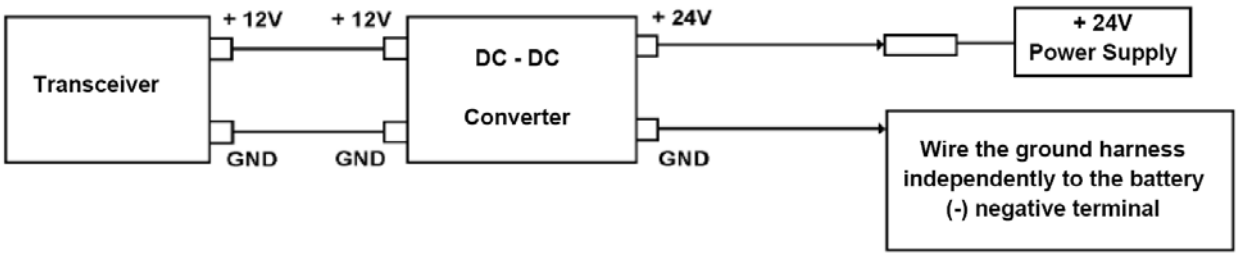
12. When installing an additional electric device, install a protected wiring circuit via a fuse or fusible link. The fuse rating should be chosen to protect both the device and wiring circuit.

Use of Transceiver and Voltage Converter

If a transceiver and/or voltage converter is installed, ensure that the equipment is,

- NOT located in close proximity to the vehicle's existing on-board ECU's and that the
- grounding wire for the equipment is connected to the battery supply's negative terminal.

Otherwise an induced current or noise can potentially flow in the vehicle's electrical systems disrupting the stability of the electrical equipment, particularly ECU's that control engine, transmission and braking system functions etc.



CAB

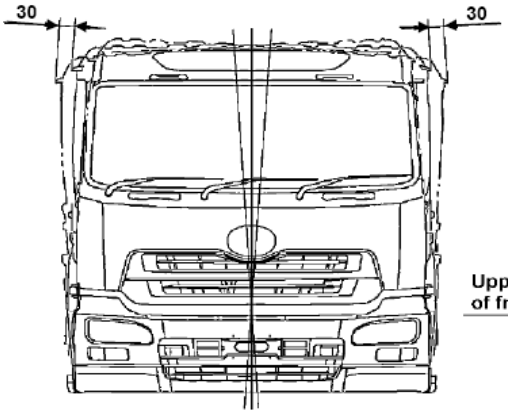
Allowance for Cab Tilt and Suspension Movement (when installing lights, harnesses, etc)

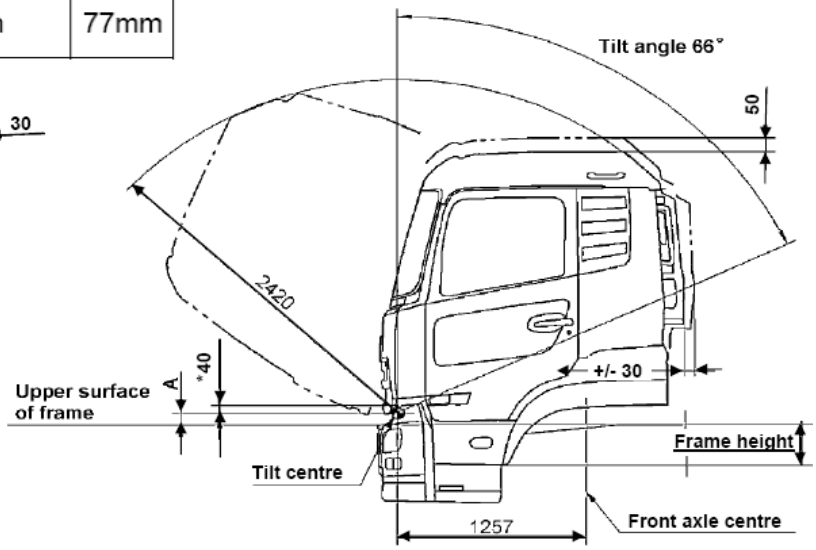
Provide a clearance and sufficient harness length to allow for cab movement of;

- +/- 30mm longitudinal,
- 50mm vertical,
- 30mm lateral and a
- *40mm allowance for the tilt centre to rise when starting to tilt the cab (i.e. A + 40mm).

Vehicle model	Frame height	A
GKB Tractor	275mm	99mm
CWB Series	298mm	77mm
GWB Tractor		

Unit : mm



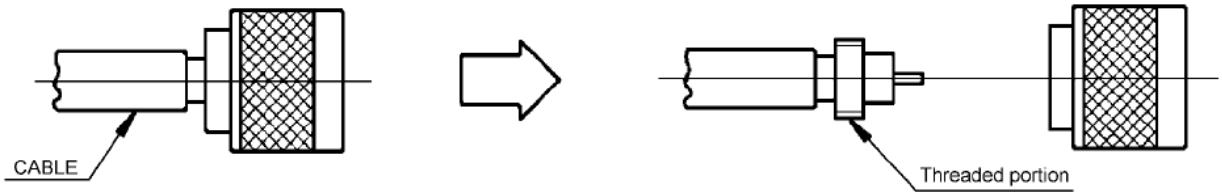


Installation of Equipment/Attachments around the Cab

1. Laying of antenna cable for radio equipment
   The recommended procedure for laying antenna cables for radio equipment is as follows:

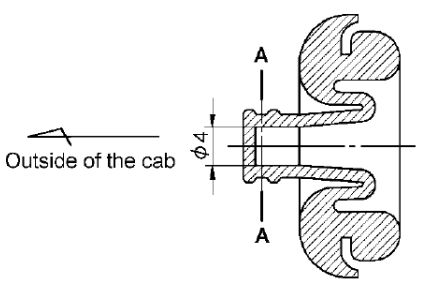
<Procedure for laying antenna cables in the cab>

1) Separate the connector portions of cable.

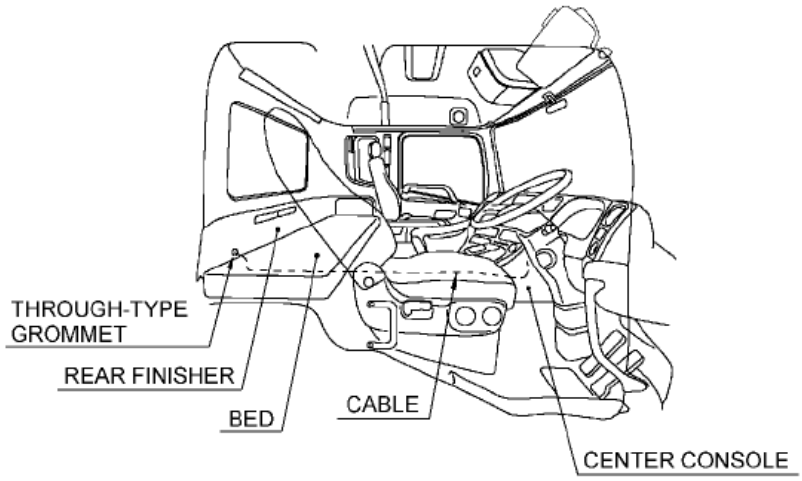


2) Remove the grommet from the back panel.
3) Prepare a through-type grommet (Part No. 24215 Z5010). Cut the end portion A-A.
4) Put the cable through the grommet, and install the cable with the grommet to the back panel.
   To prevent water from entering, be sure to apply tape sealing at the penetration portion A-A.

Unit : mm

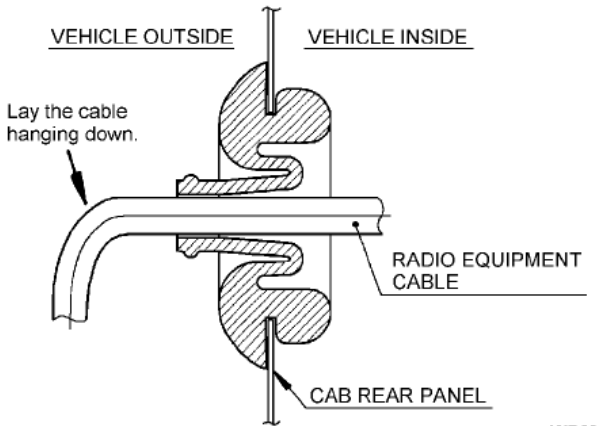


5) Remove the hook and clips for securing the rear finisher located at the rear of the bed room in the cab and pull out the cable to the cab interior.
6) Lay the cable from the underside of the bed to the lower right of the centre console, and then to the radio equipment installation position located at the cluster meter.



CAUTION

- **Be sure to fix the cable laid within the cab interior with tape, clips etc.**
- **Clamp the cable so that it doesn't interfere with edge portions inside or outside the cab.**
- **When putting the cable through the grommet, lay the cable to the position lower than the grommet, and then raise the cable to put it through the grommet.**



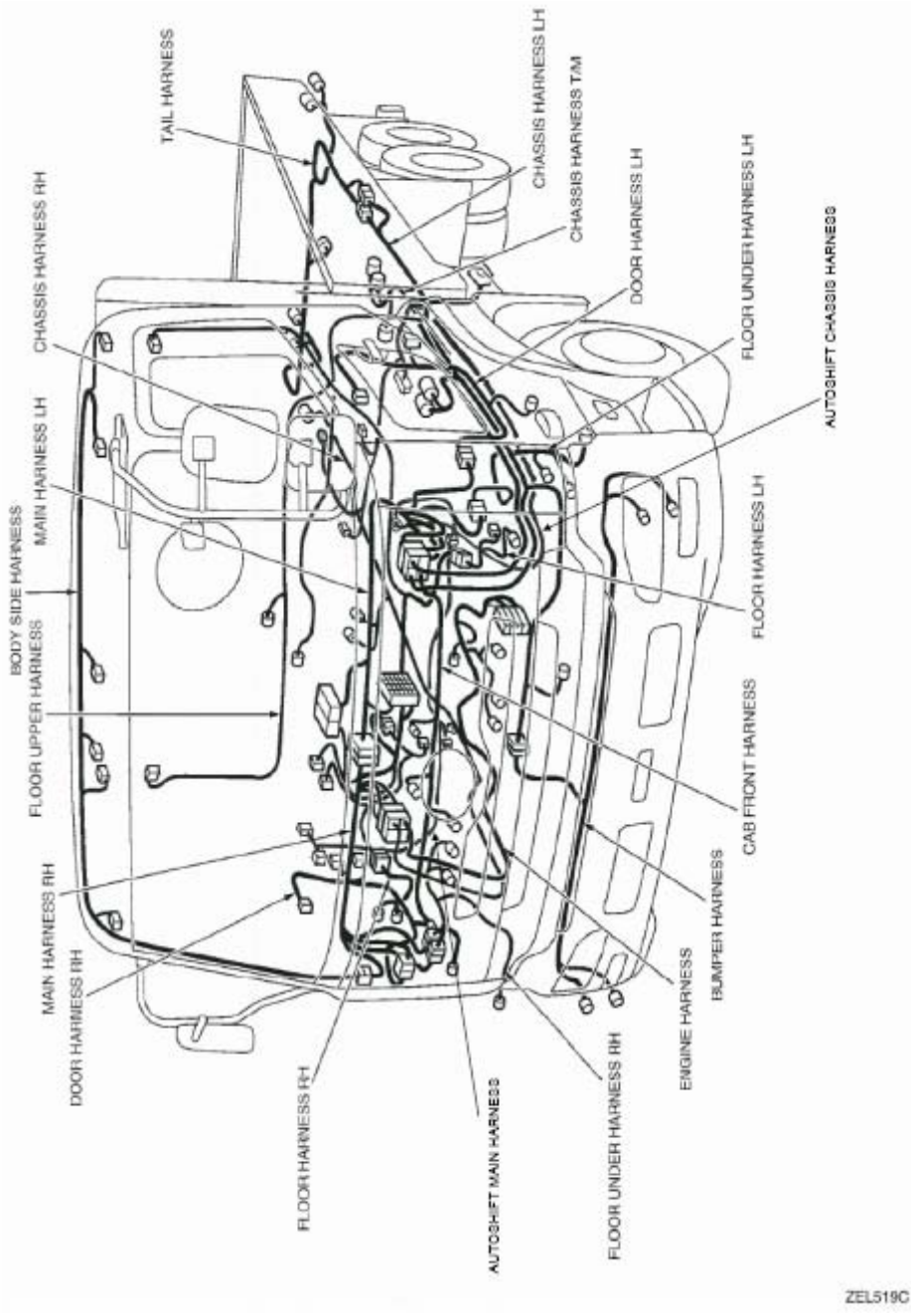
- **Lay the antenna cable at a distance of about 300mm from the existing wiring on the vehicle. If the antenna cable is laid along the existing vehicle wiring, the electronic equipment of the vehicle may malfunction**
- **The approved type of radio equipment should be used and installed properly.**

HARNESS LAYOUT

See “HD-T wiring diagrams” in the UDTC Service Manual for detailed information on the electrical system.

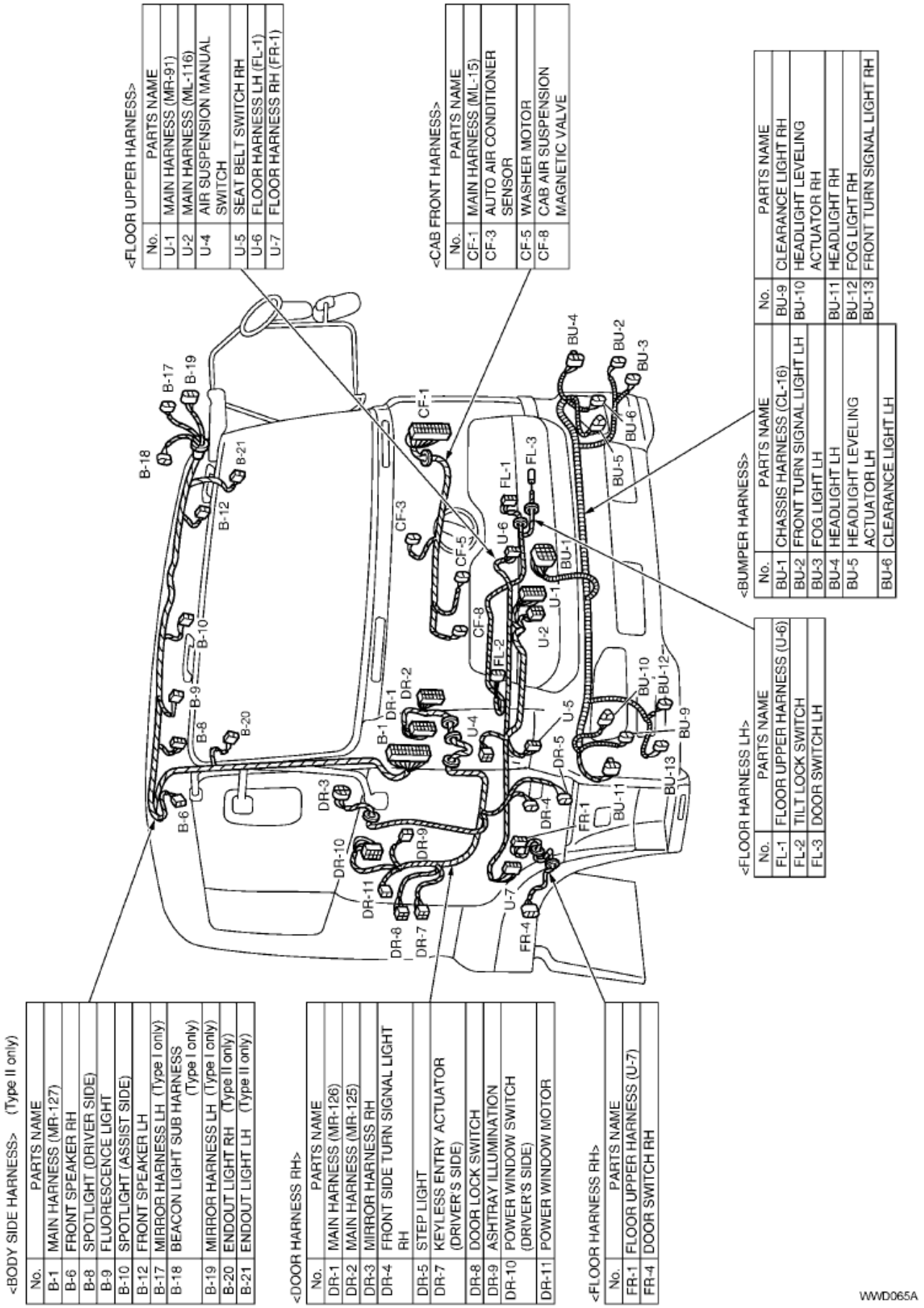
SCHEMATIC DIAGRAM

The schematic diagram illustrates how each harness (main harness, chassis harness, floor harness, floor upper harness, body side harness, etc.) is wired on the actual vehicle. Depending on the model, however, the arrangements of the wires and units may sometimes be different, so the respective schematic diagrams must be carefully checked to see they coincide with the arrangements in the actual vehicle.



NOTE: For more detailed information on the Autoshift® components refer to the UDT “Autoshift® service manual supplement” Publication number AUS000183

CAB HARNESS



<FLOOR UPPER HARNESS>

No.	PARTS NAME
U-1	MAIN HARNESS (MR-91)
U-2	MAIN HARNESS (ML-116)
U-4	AIR SUSPENSION MANUAL SWITCH
U-5	SEAT BELT SWITCH RH
U-6	FLOOR HARNESS LH (FL-1)
U-7	FLOOR HARNESS RH (FR-1)

<CAB FRONT HARNESS>

No.	PARTS NAME
CF-1	MAIN HARNESS (ML-15)
CF-3	AUTO AIR CONDITIONER SENSOR
CF-5	WASHER MOTOR
CF-8	CAB AIR SUSPENSION MAGNETIC VALVE

<BUMPER HARNESS>

No.	PARTS NAME	No.	PARTS NAME
BU-1	CHASSIS HARNESS (CL-16)	BU-9	CLEARANCE LIGHT RH
BU-2	FRONT TURN SIGNAL LIGHT LH	BU-10	HEADLIGHT LEVELING ACTUATOR RH
BU-3	FOG LIGHT LH	BU-11	HEADLIGHT RH
BU-4	HEADLIGHT LH	BU-12	FOG LIGHT RH
BU-5	HEADLIGHT LEVELING ACTUATOR LH	BU-13	FRONT TURN SIGNAL LIGHT RH
BU-6	CLEARANCE LIGHT LH		

<FLOOR HARNESS LH>

No.	PARTS NAME
FL-1	FLOOR UPPER HARNESS (U-6)
FL-2	TILT LOCK SWITCH
FL-3	DOOR SWITCH LH

<BODY SIDE HARNESS> (Type II only)

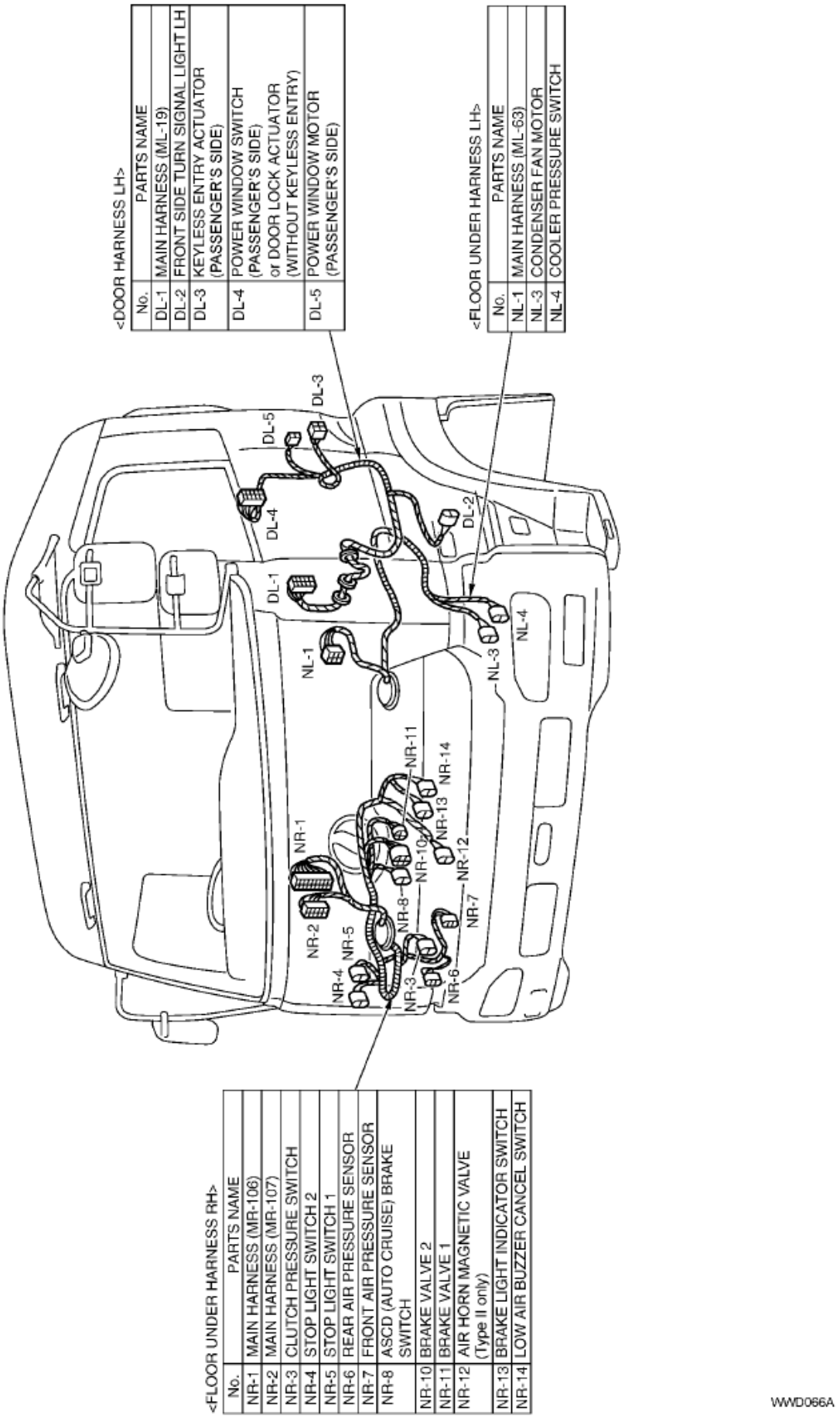
No.	PARTS NAME
B-1	MAIN HARNESS (MR-127)
B-6	FRONT SPEAKER RH
B-8	SPOTLIGHT (DRIVER SIDE)
B-9	FLUORESCENCE LIGHT
B-10	SPOTLIGHT (ASSIST SIDE)
B-12	FRONT SPEAKER LH
B-17	MIRROR HARNESS LH (Type I only)
B-18	BEACON LIGHT SUB HARNESS (Type I only)
B-19	MIRROR HARNESS LH (Type I only)
B-20	ENDOUT LIGHT RH (Type II only)
B-21	ENDOUT LIGHT LH (Type II only)

<DOOR HARNESS RH>

No.	PARTS NAME
DR-1	MAIN HARNESS (MR-126)
DR-2	MAIN HARNESS (MR-125)
DR-3	MIRROR HARNESS RH
DR-4	FRONT SIDE TURN SIGNAL LIGHT RH
DR-5	STEP LIGHT
DR-7	KEYLESS ENTRY ACTUATOR (DRIVER'S SIDE)
DR-8	DOOR LOCK SWITCH
DR-9	ASHTRAY ILLUMINATION
DR-10	POWER WINDOW SWITCH (DRIVER'S SIDE)
DR-11	POWER WINDOW MOTOR

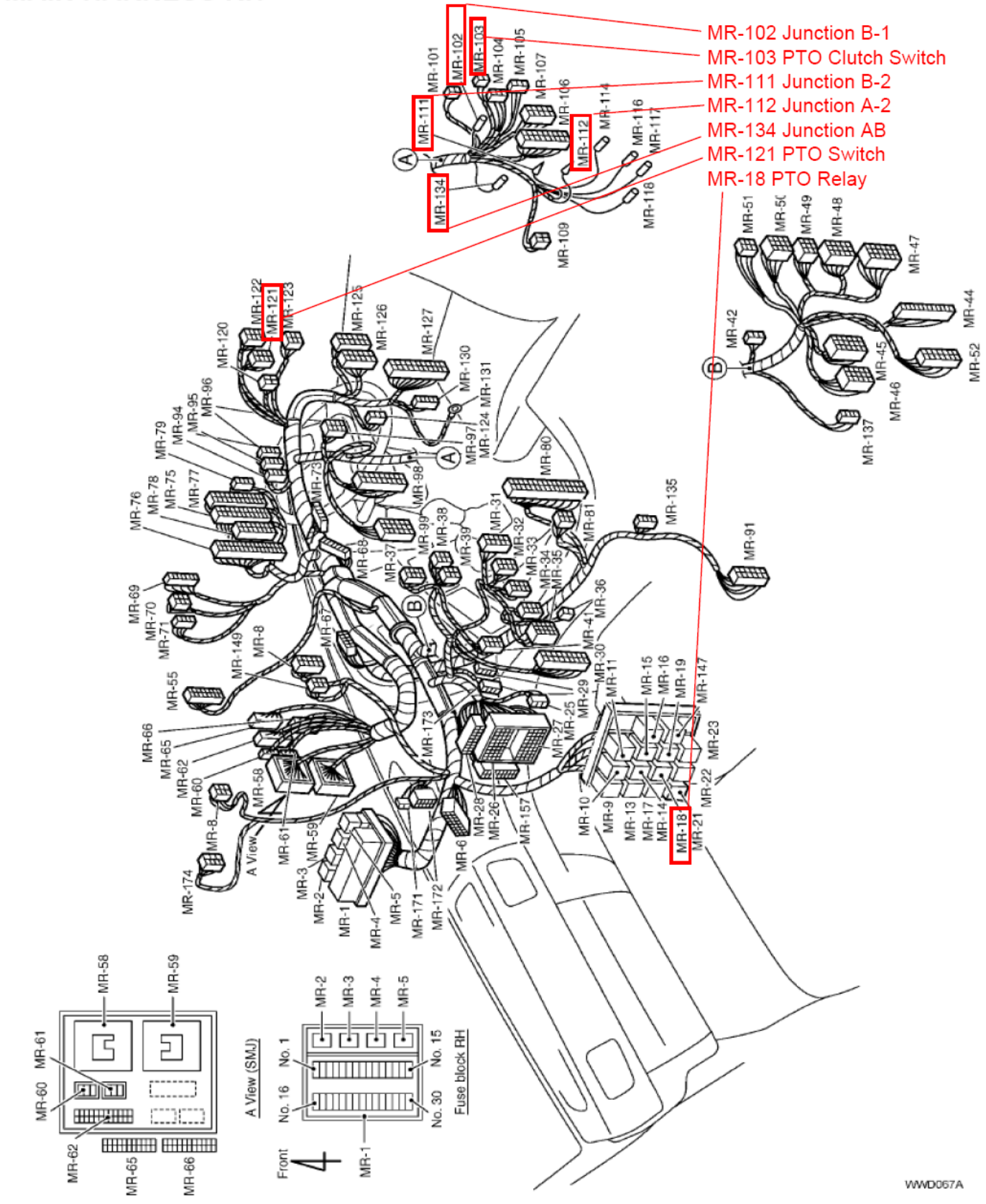
<FLOOR HARNESS RH>

No.	PARTS NAME
FR-1	FLOOR UPPER HARNESS (U-7)
FR-4	DOOR SWITCH RH


<DOOR HARNESS LH>
No. | PARTS NAME
DL-1 | MAIN HARNESS (ML-19)
DL-2 | FRONT SIDE TURN SIGNAL LIGHT LH
DL-3 | KEYLESS ENTRY ACTUATOR (PASSENGER'S SIDE)
DL-4 | POWER WINDOW SWITCH (PASSENGER'S SIDE) or DOOR LOCK ACTUATOR (WITHOUT KEYLESS ENTRY)
DL-5 | POWER WINDOW MOTOR (PASSENGER'S SIDE)
<FLOOR UNDER HARNESS LH>
No. | PARTS NAME
NL-1 | MAIN HARNESS (ML-63)
NL-3 | CONDENSER FAN MOTOR
NL-4 | COOLER PRESSURE SWITCH
<FLOOR UNDER HARNESS RH>
No. | PARTS NAME
NR-1 | MAIN HARNESS (MR-106)
NR-2 | MAIN HARNESS (MR-107)
NR-3 | CLUTCH PRESSURE SWITCH
NR-4 | STOP LIGHT SWITCH 2
NR-5 | STOP LIGHT SWITCH 1
NR-6 | REAR AIR PRESSURE SENSOR
NR-7 | FRONT AIR PRESSURE SENSOR
NR-8 | ASCD (AUTO CRUISE) BRAKE SWITCH
NR-10 | BRAKE VALVE 2
NR-11 | BRAKE VALVE 1
NR-12 | AIR HORN MAGNETIC VALVE (Type II only)
NR-13 | BRAKE LIGHT INDICATOR SWITCH
NR-14 | LOW AIR BUZZER CANCEL SWITCH
WWD066A

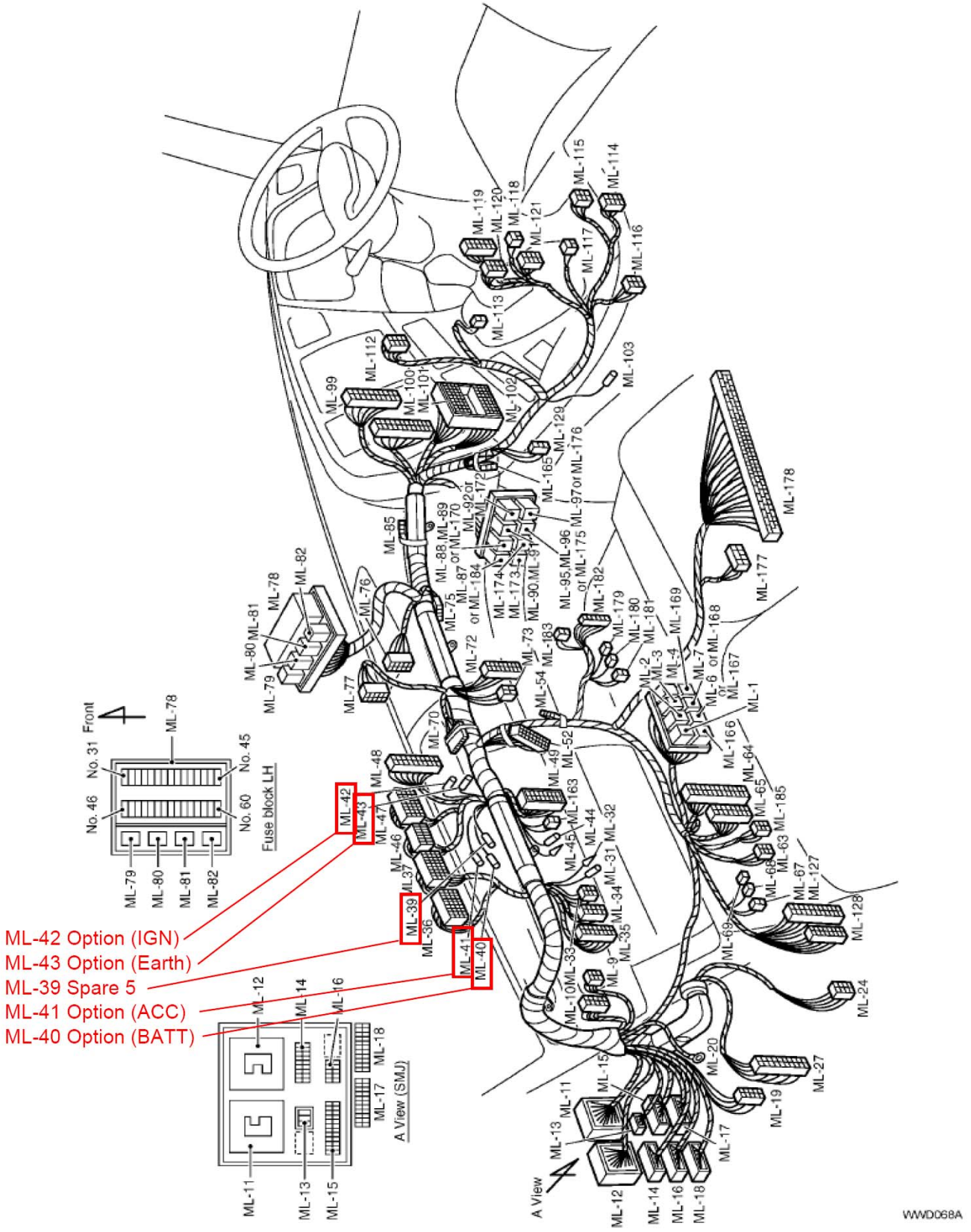
NOTE: For more detailed information on the Autoshift® components refer to the UDT "Autoshift® service manual supplement" Publication number AUS000183

MAIN HARNESS RH



NOTE: For more detailed information on the Autoshift® components refer to the UDT "Autoshift® service manual supplement" Publication number AUS000183

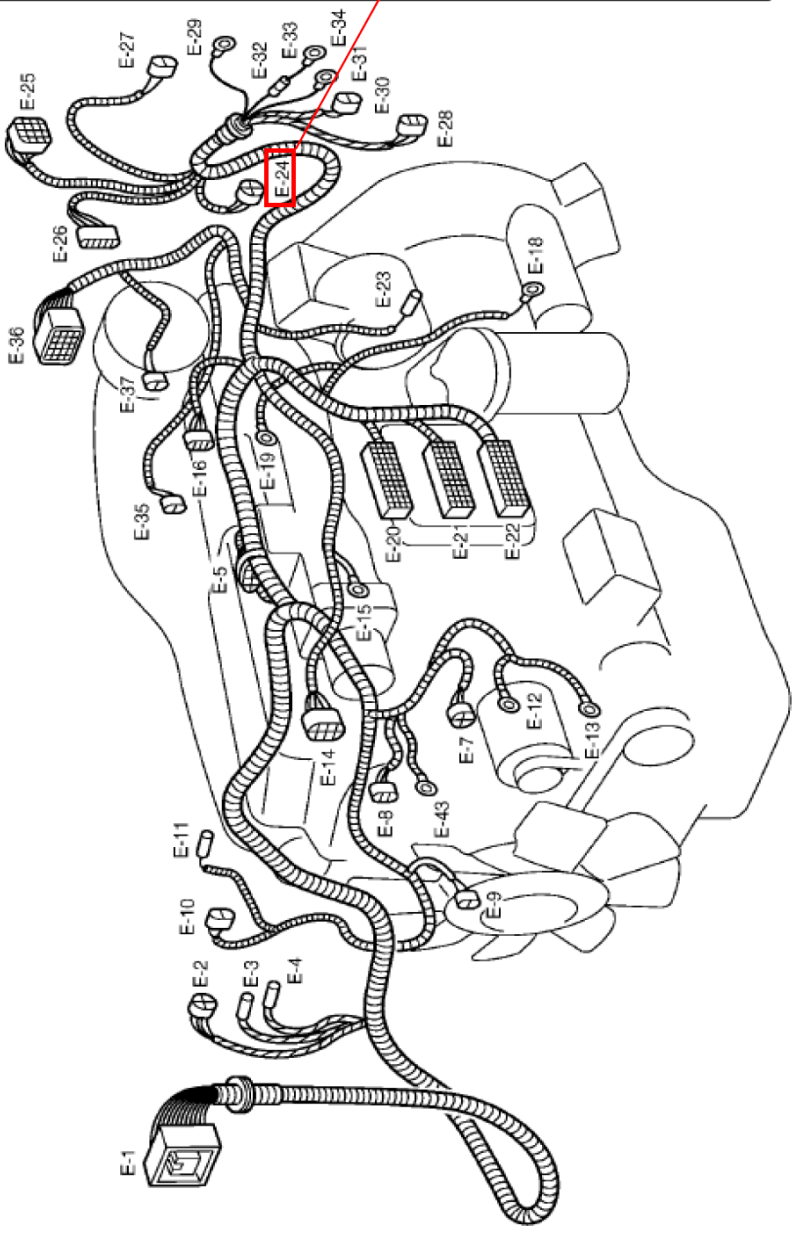
MAIN HARNESS LH



NOTE: For more detailed information on the Autoshift® components refer to the UDT "Autoshift® service manual supplement" Publication number AUS000183

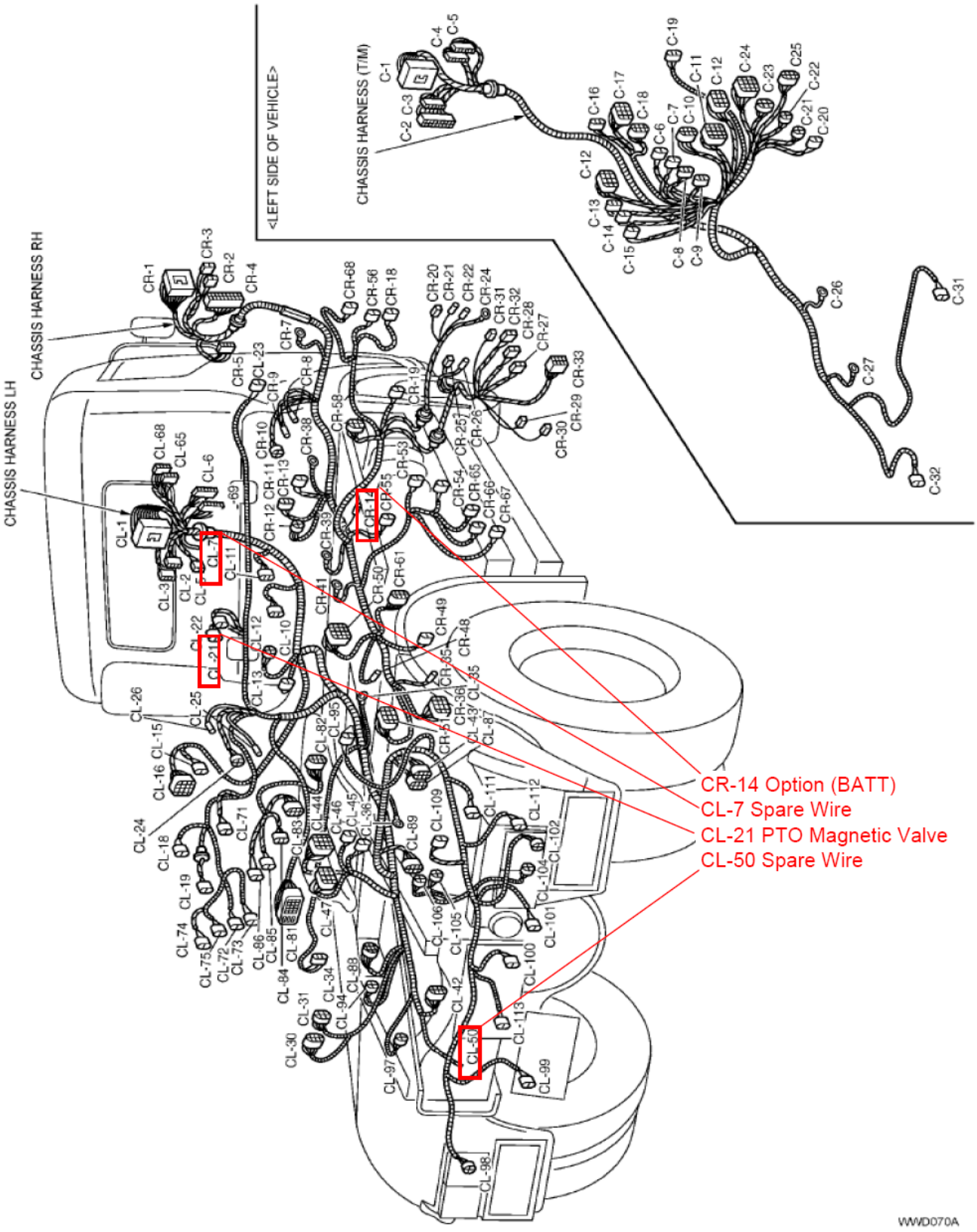
ENGINE HARNESS

No.	PARTS NAME
E-1	MAIN HARNESS (MR-59)
E-2	CHASSIS HARNESS (CR-10) (Type I)
E-3	CHASSIS HARNESS (CR-8)
E-4	CHASSIS HARNESS (CR-9)
E-5	CAN-BAS CONNECTOR
E-7	ALTERNATOR
E-8	ENGINE COOLANT TEMPERATURE SENSOR
E-9	EE BRAKE MAGNETIC VALVE
E-10	OIL PRESSURE SENDER
E-11	OIL FILTER SWITCH
E-12	ALTERNATOR (B)
E-13	CAR COOLER MAGNETIC CLUTCH
E-14	EGR VALVE DC-MOTOR (Type I)
E-15	AIR HEATER
E-16	BOOST SENSOR
E-18	STARTER (C)
E-19	ENGINE EARTH 2
E-20	ENGINE CONTROL UNIT (GRAY)
E-21	ENGINE CONTROL UNIT (BLUE)
E-22	ENGINE CONTROL UNIT (BLACK)
E-23	FUEL FILTER SWITCH
E-24	PTO ACCELERATOR SENSOR
E-25	EGR CONTROL UNIT (Type I)
E-26	AIR FLOW SENSOR (Type I)
E-27	AIR FILTER SWITCH (Type I)
E-28	SAFETY RELAY
E-29	STARTER BLOCK RELAY
E-30	HEATER RELAY
E-31	HEATER RELAY
E-32	FUSIBLE LINK (BROWN)
E-33	ENGINE HARNESS (E-32) (Type I)
E-34	HEATER RELAY (Type I)
E-35	CRANKSHAFT SENSOR
E-36	INJECTOR HARNESS
E-37	CAMSHAFT SENSOR
E-43	OVERHEAT SWITCH

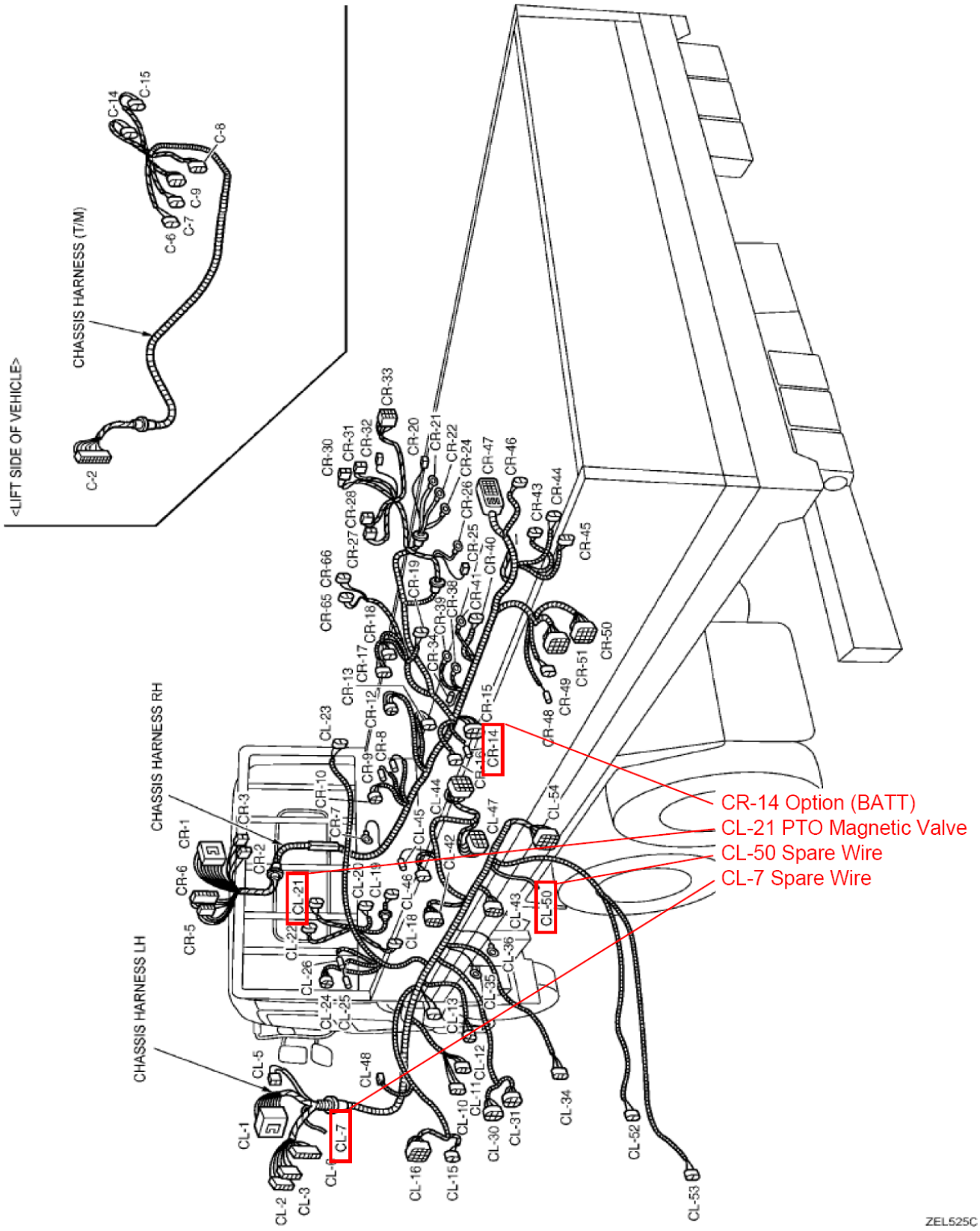


WWD069A

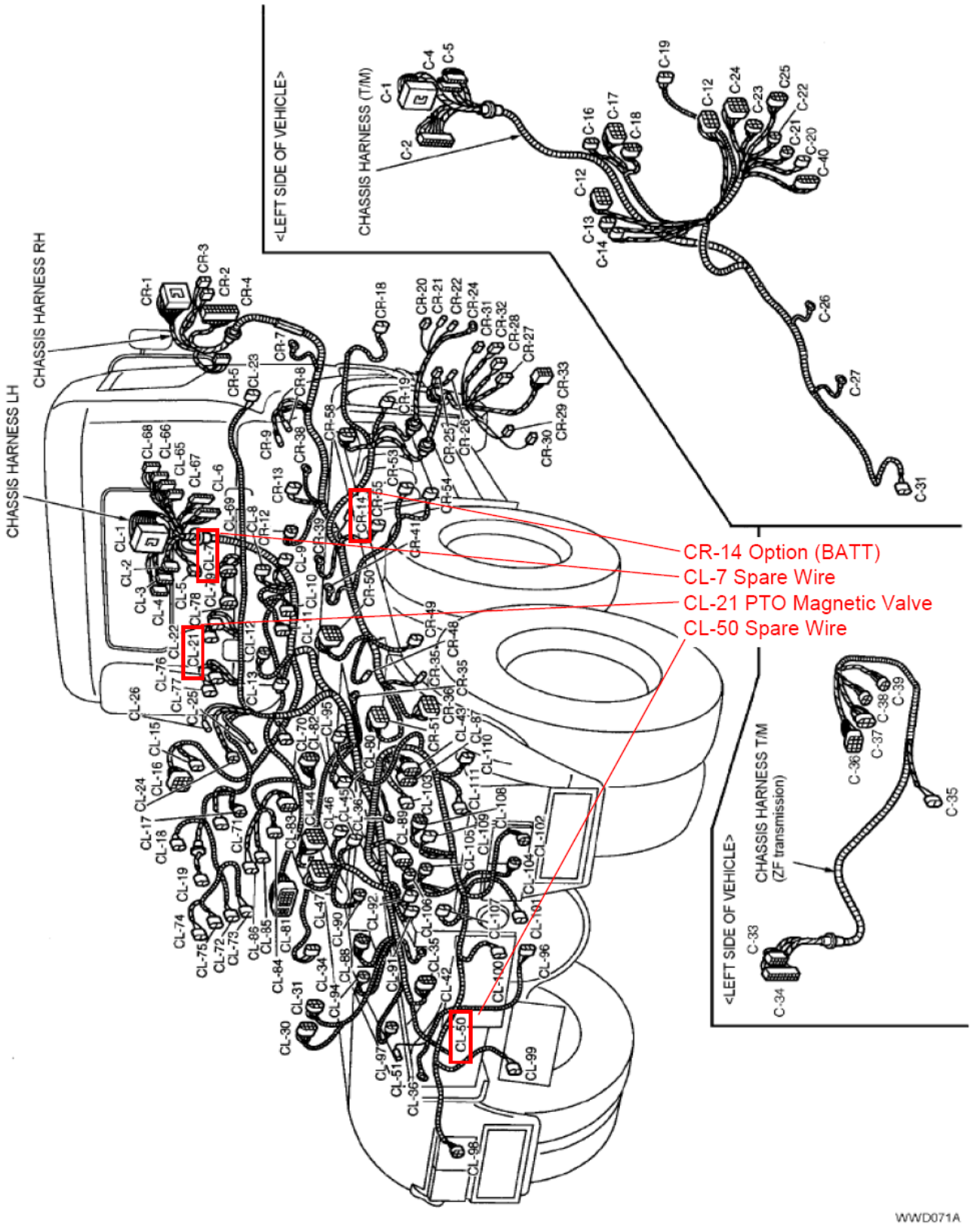
CHASSIS HARNESS
GKB SERIES



CWB SERIES


<LIFT SIDE OF VEHICLE>
CHASSIS HARNESS (T/M)
C-2
C-6
C-7
C-9
C-8
C-14
C-15
CHASSIS HARNESS RH
CHASSIS HARNESS LH
CR-14 Option (BATT)
CL-21 PTO Magnetic Valve
CL-50 Spare Wire
CL-7 Spare Wire
ZEL525C

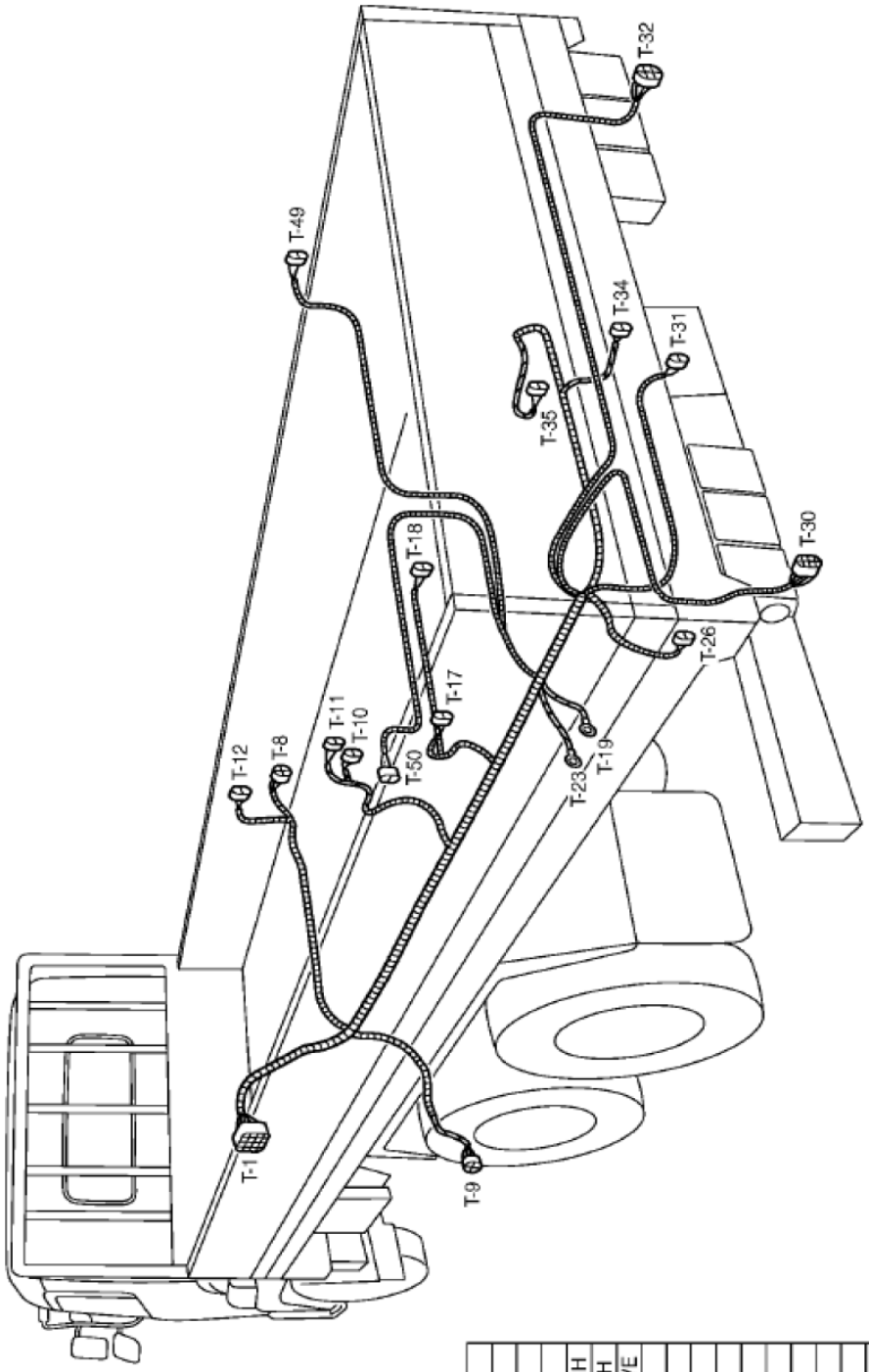
GWB SERIES



NOTE: For more detailed information on the Autoshift® components refer to the UDT “Autoshift® service manual supplement” Publication number AUS000183

TAIL HARNESS

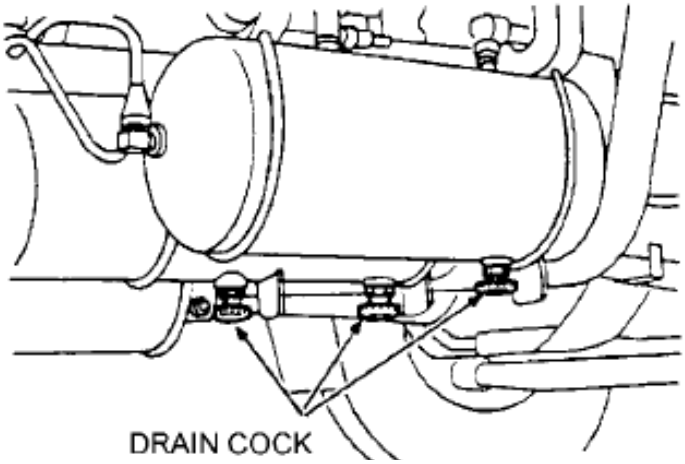
CWB4DAW Trailer Electrical Connections



No.	PARTS NAME
T-1	CHASSIS HARNESS (CL-54)
T-8	ABS MODULATOR REAR RH
T-9	ABS MODULATOR REAR LH
T-10	WHEEL SPEED SENSOR REAR RH
T-11	WHEEL SPEED SENSOR REAR LH
T-12	3RD DIFF-LOCK MAGNETIC VALVE
T-17	AIR PRESSURE SWITCH 5
T-18	AIR PRESSURE SWITCH 6
T-19	FLAME EARTH
T-23	FLAME EARTH
T-26	BACKUP LIGHT (SPARE)
T-30	REAR COMBINATION LIGHT LH
T-31	LICENSE LIGHT
T-32	REAR COMBINATION LIGHT RH
T-34	BACKUP LIGHT
T-35	BACK BUZZER
T-49	SIDE TURN SIGNAL LIGHT RH
T-50	SIDE TURN SIGNAL LIGHT LH

Discharge of Air

WARNING: Prior to disconnecting any air system components or air piping, the stored energy (i.e. air pressure) must be drained from EACH air system circuit by opening each of the drain cocks provided in the lower surface of each air reservoir.



Typical Drain Cock Locations

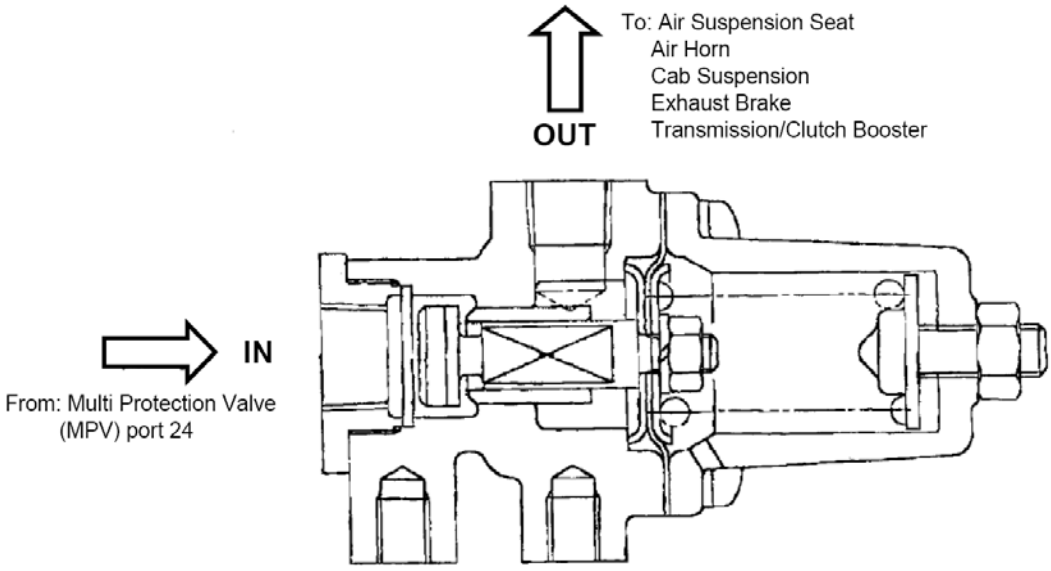
Preferential Charging of the Air System

When additional air operated items are installed (i.e. air horns, PTO's etc.) air supply **MUST** be taken from the accessories circuit (i.e. clutch booster, cab suspension, driver's seat etc.) delivery (outlet) port side of the air system **Pressure Reducing Valve (PRV)**, as per the listed clauses extracted from ADR 35/02:-

4.7.8 Where the device generating the energy for any number of *'Brake Power Unit 35/…'* supplies energy to other devices, the design shall be such that all the *'Brake Power Unit 35/…'* are preferentially charged to an energy level of not less than 0.69 *'E'* (450 kPa).

4.7.9 In the case of *'Service Brake Systems'* incorporating *'Brake Power Unit 35/…'* the design shall be such that all *'Brake Power Unit 35/…'* must preferentially service the brake system if the energy falls below 0.69 *'E'* (450 kPa).

Definition: Brake Power Unit 35/… - a device installed in a brake system that stores the energy required to actuate the brakes and provides the energy either directly or indirectly through an auxiliary device, with the operator action consisting only of modulating the energy application level.



Pressure Reducing Valve (refer air piping diagrams for location)

Installation and Removal of Nylon Tube for Air Piping and Connector

1. Precautions for Handling Nylon Tube and Connector

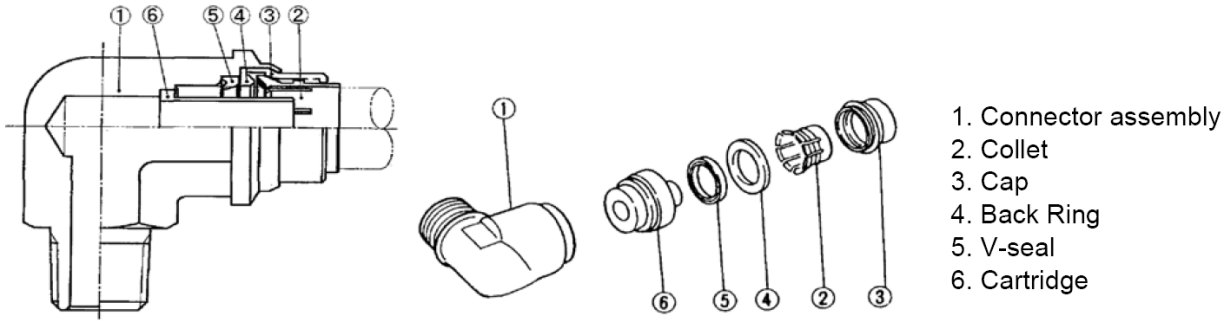
- Nylon tubes are weak against heat. Before performing welding operations for remodelling of vehicles, remove nylon tubes.
- Nylon tubes are weak against acid. Do not touch nylon tubes with waste cloth or work gloves containing battery fluid.
- When installing or removing nylon tubes, be careful not to bend them. If a nylon tube is bent, replace it with a new one.
- Take extra care to prevent nylon tubes from interfering with the equipment or attachments or being caught in.
- There are two, push-on and the nut-sleeve insert, types of connectors for nylon tubes depending on the installation. For removal and installation procedures, refer the following instructions.
- When installing nylon tubes, ensure that the tube bending radius is larger than the minimum values shown in the table below.

Unit: mm

Tube Outside Dia.	Ø6	Ø8	Ø10	Ø12	Ø15
Bending radius	60	80	100	120	150

Nylon Tube Minimum Bending Radius

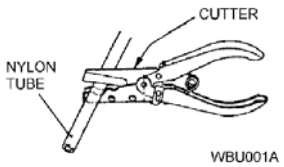
2. Removal/Installation for Push-On Type Connector



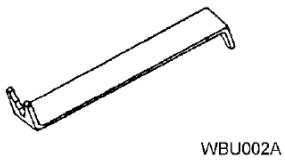
Typical HD-T Push-On Type Connecter Assembly

a. Tools

Cutter, Nylon Tube: Pt No. 99661 Z0002



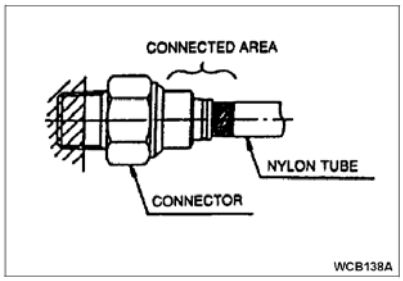
Push Bar:
Pt No. 99886 Z0003 use for 6, 8, 10 and 12mm diameter tube.
Pt No. 99886 Z0004 use for 10, 12 and 15mm diameter tube.



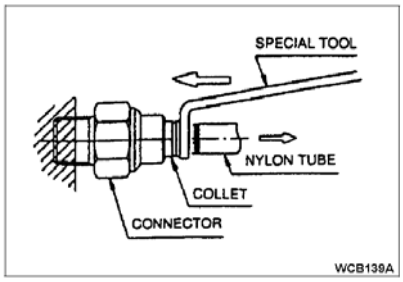
b. Removal (Push-On type)

1. Discharge the stored energy (i.e. air pressure). Refer item “Discharge of Air” in this manual section.

2. Remove dirt and dust from the connected area before disassembly.
   Note: To prevent incorrect re-assembly, it is recommended that the tube and connector be identified with a tag or similar means of identification.

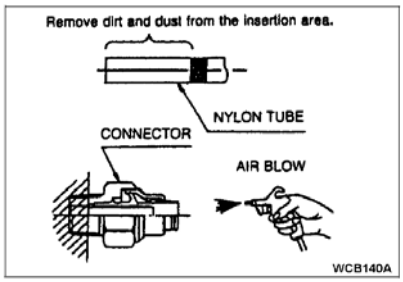


3. Using special tool (99886 Z0003 or 99886 Z0004) push the collet towards the connector body whilst applying a pull force to the nylon tube.



CAUTION: Do not push the collet with a sharp-tipped tool such as a flat-blade screwdriver to extract the nylon tube. The collet could be damaged or deformed, making it impossible to use.

4. Remove dirt and dust from the insertion surface of the nylon tube. Blow air inside the connector thoroughly to remove foreign materials.

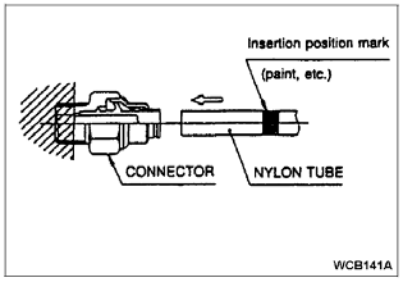


CAUTION

- **When removing dirt and dust from inside the connector, disconnect the connector from the piping. Be sure not to allow dirt and dust to enter the piping.**
- **Never use oil to wash the connector as grease is used on the inside rubber seal. Washing with oil will eliminate the grease.**
- **Oil may be used to wash the surface of the nylon tube.**

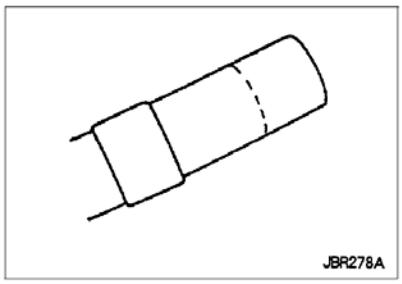
c. Installation (Push-On type)

1. Make sure there is no damage, burrs, dirt or dust on the insertion area of the nylon tube.

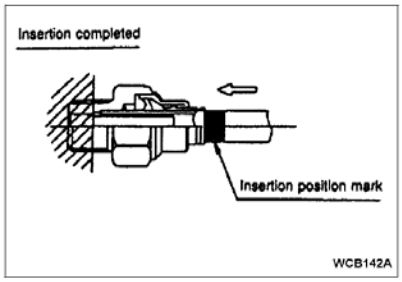


NOTE

- **The tube may be reused even though the collet pawl mark remains at the tip of the tube. This does not affect the sealing performance.**



2. Push the nylon tube into the connector until it reaches the insertion position mark.



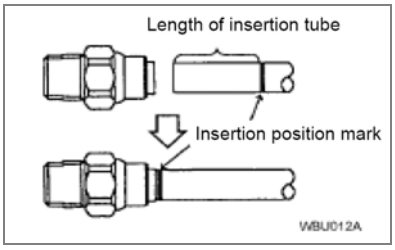
NOTE

- **A resistance is felt twice when inserting the nylon tube. Be sure to continue to push the tube until it reaches the insertion position mark. If insertion is insufficient air leakage may result.**
- **If replacing the tube, mark the insertion length on the nylon tube in accordance with the table below and then insert the nylon tube.**

Marking position

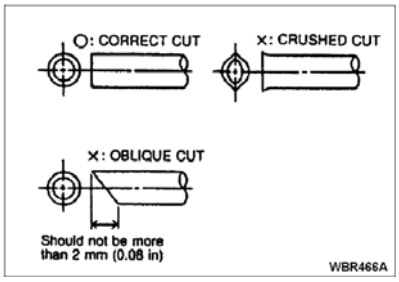
Unit: mm

Tube Outside Dia.	Ø6	Ø8	Ø10	Ø12	Ø15
Length from tube tip	22	24	24	25	27

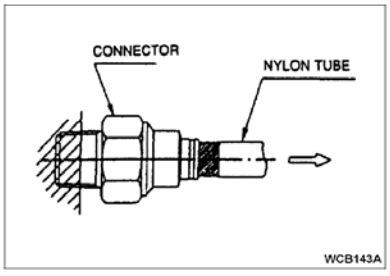


CAUTION

- **Do not use a tube with a crushed cut surface or an obliquely cut tube end as it could damage the seal when the connector is inserted, resulting in air leakage.**
- **When cutting a tube, use a special cutter (99661 Z0002) and cut it perpendicularly.**
- **When inserting a nylon tube, do not apply sealing bond as the sealing performance will be reduced making it impossible to re-use the connector**



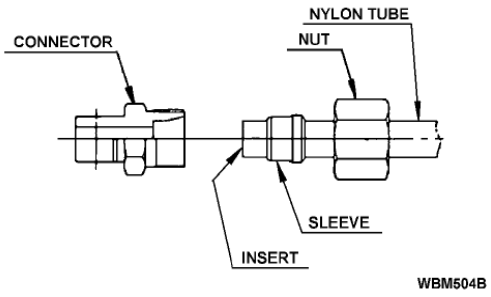
3. After insertion, apply a pull force to the nylon tube by hand to make sure it is securely connected.



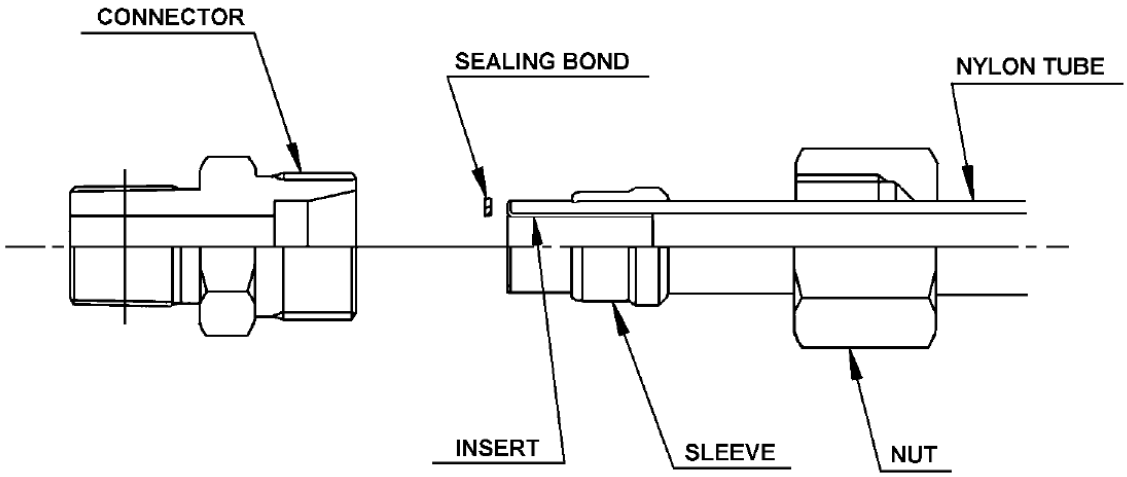
4. Use soapsuds to ensure there is no air leakage.

3. Installation Procedure of Nut-Sleeve Insert Type of Connector

1) Check the end of the nylon tube, nut, sleeve, and insert for flaw, burr, or dirt.
2) Apply sealing bond to the insert end and tighten the nut firmly with the specified torque
   (See the Tightening Torque Table).
3) After installation of the insert to the connector, check for air leakage
   - If air keeps leaking after the nut is tightened with the specified torque, prepare appropriate parts shown in the table below, and replace the sleeve and insert with new ones.



Tube Size (mm)	Width Across Flats (mm)	Tightening Torque: Nm
6	14	9.8 ~ 14.7
8	17	14.7 ~ 19.6
10	19	19.6 ~ 24.5
12	22	24.5 ~ 29.4
15	27	39.2 ~ 44.1

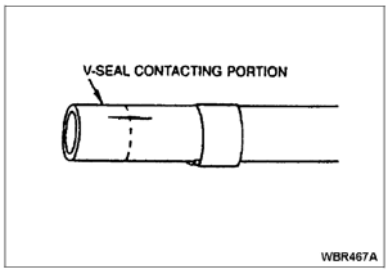


Tube Size (mm)	Part No.		
	Nut	Sleeve	Insert
6	01631 00214	01634 00014	01635 00014
8	01631 00224	01634 00024	01635 00024
10	01631 00234	01634 00034	01635 00034
12	01631 00244	01634 00044	01635 00044
15	01631 00254	01634 00054	01635 00054

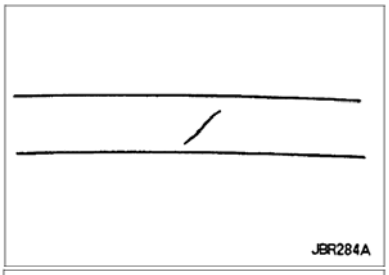
4. Inspection of Nylon Tube and Connector

- Check the nylon tube and connector. If one the following conditions exists, replace them.
- Nylon tubes are sensitive to heat.
- Do not allow them to contact battery fluid. If they do contact battery fluid, replace the tube with a new one.

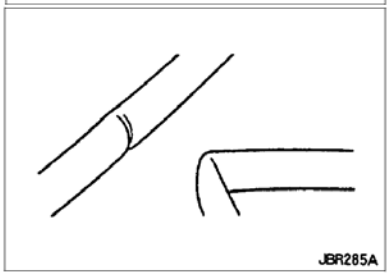
- When there are scratches on the nylon tube insertion portion (scratches on the portion where the V-seal or sleeve contacts the nylon tube cause air leakage).



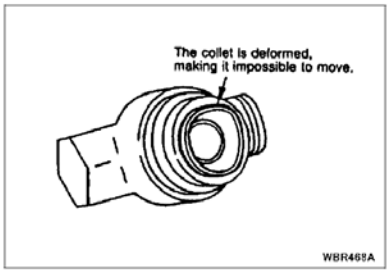
- When there are cuts caused by an edged tool on the surface of the nylon tube.



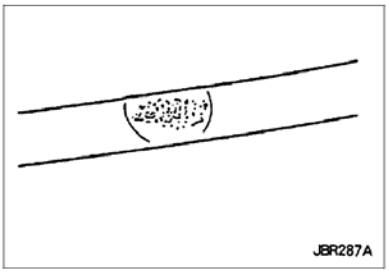
- When there is a cause on the nylon tube caused by bending.



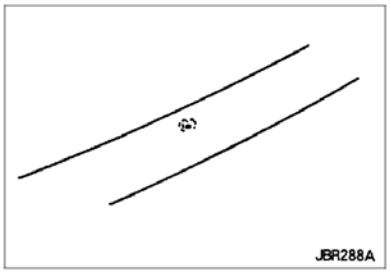
- When the collet, cap or connector inner surface is damaged or deformed.



- When the surface of the nylon tube is deformed due to heat.



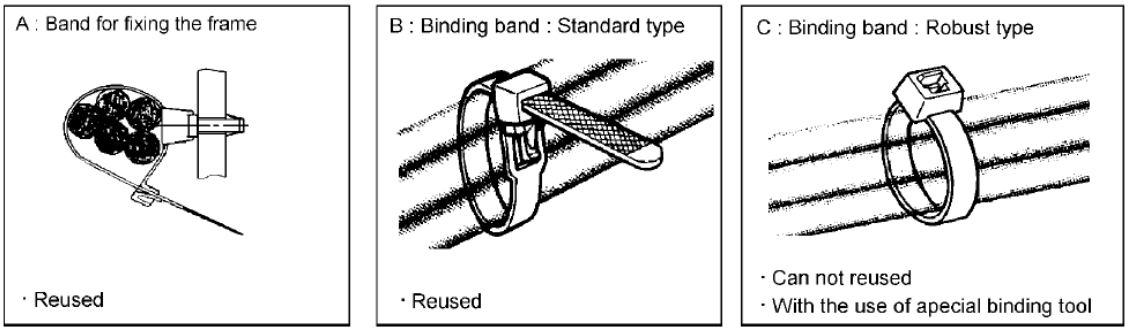
- When there are pin holes on the surface of the nylon tube caused by spatter during welding.



5. Installation and Removal of the Binding Band of Nylon Tubes for Air Piping

1) Precaution on binding band

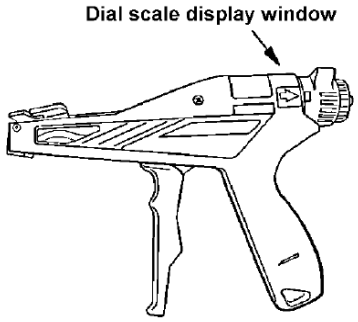
There are three types of binding bands for nylon tubes depending on the installation position as follows: Install or remove the C type of band according to the following procedure.


A : Band for fixing the frame
· Reused
B : Binding band : Standard type
· Reused
C : Binding band : Robust type
· Can not reused
· With the use of apecial binding tool

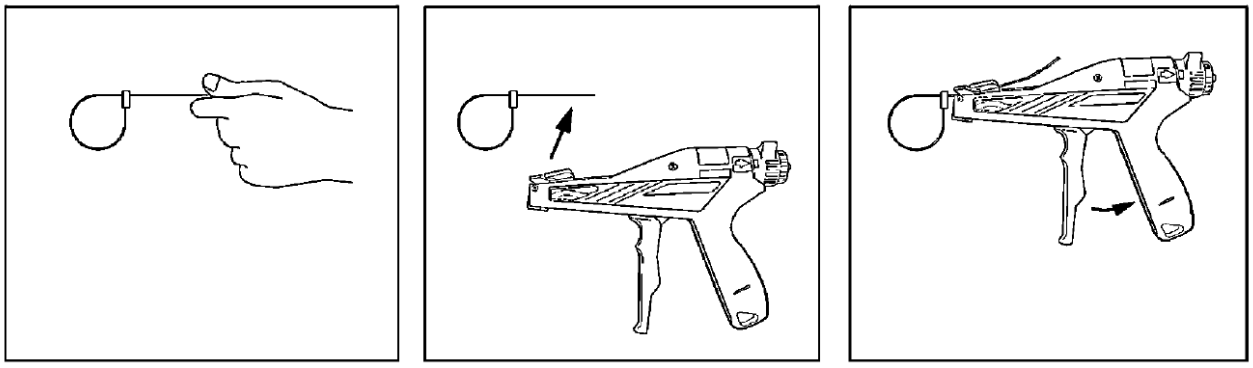
- Installation/removal procedure of the binding band of C type
  Cut the binding band to remove it. The cut band cannot be reused.
  If the binding band is removed during maintenance or body installation, be sure to reinstall a new binding band as specified below using the specified binding tool.

Part No.	Part Name
24220 02Z00	Binding band
99661 Z0003	Binding tool

With the use of the binding tool, the band is bound with the tightening force set by the dial and the surplus end portion of the band is automatically cut.



Installation of the Binding Band using Binding Tool (Part No. 99661 Z0003):



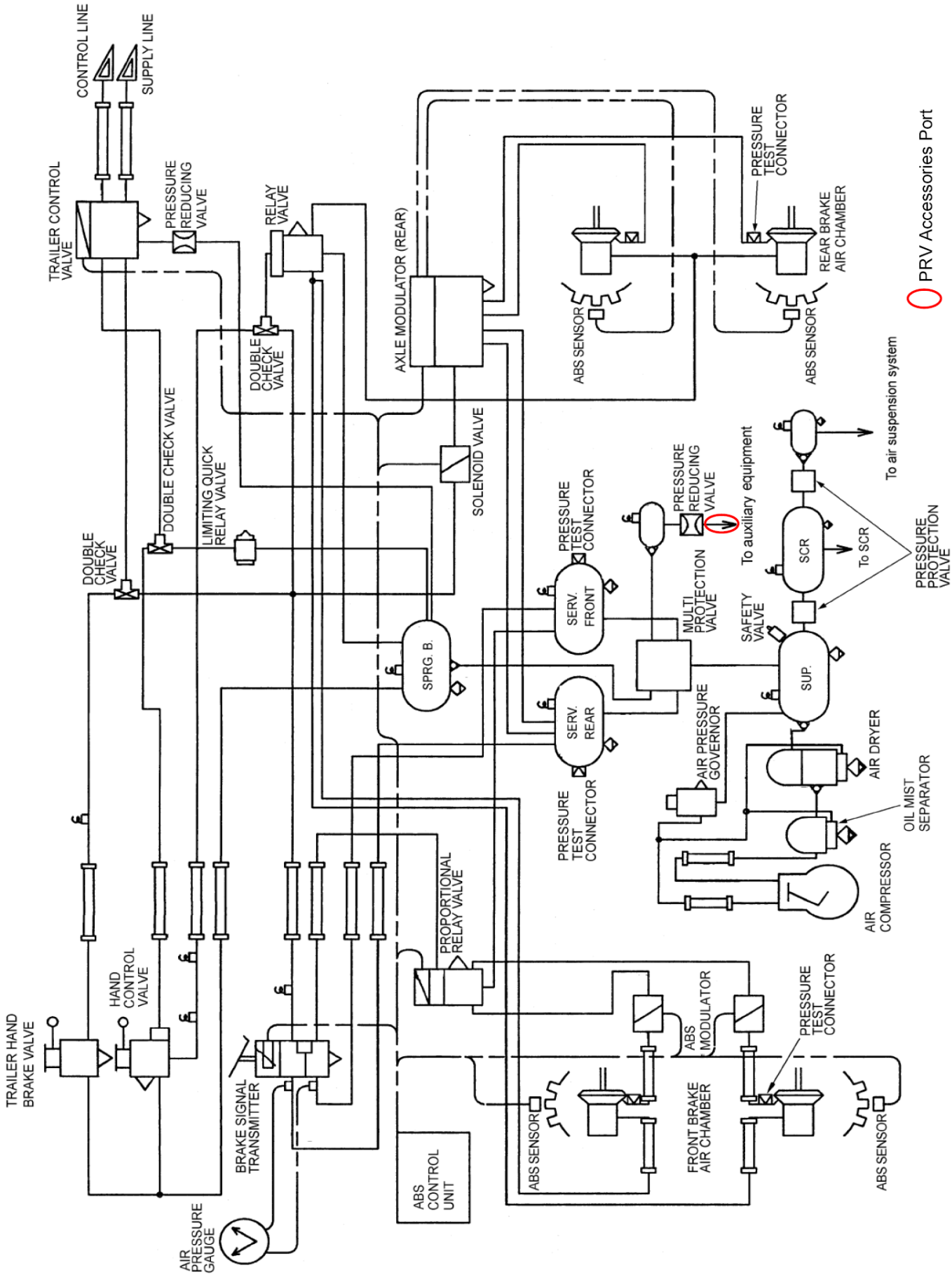
1. Tighten the binding band to some extend by hand.
2. Put the binding band end in the tool.
3. Pull the trigger. The set tightening force is applied to the object to be bound, and the tightening band is cut.

CAUTION

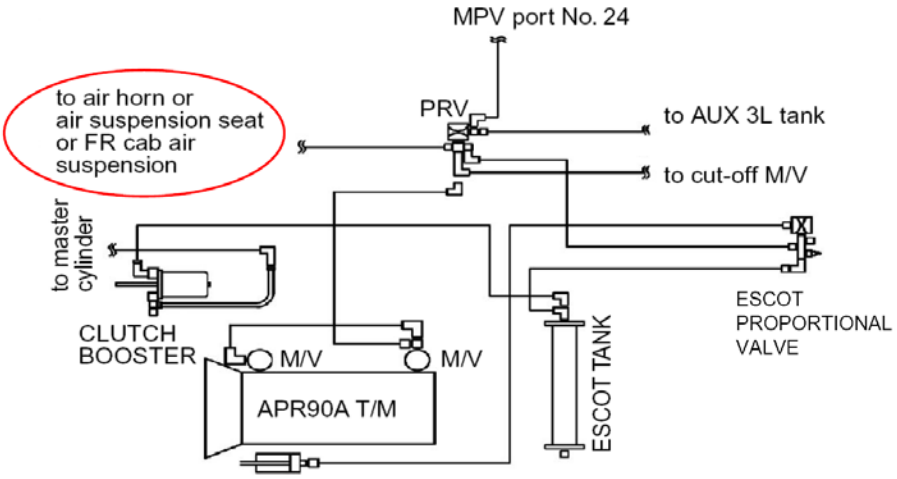
- **The tightening force adjustment dial of the tool shall be set to 1.5 (Reference tightening force: 130N {13 kgf}).**
- **If nylon tubes are tightened at a tightening force other than the specified force, the nylon tubes may be damaged.**
- **If the tightening tool is used for tightening (or cutting the surplus portion) the standard type of band, A or B, the hook of the band comes off. Do not use the tightening tool for the A or B type of band.**
- **To add or install nylon tubes when conducting the body installation, bind the new tubes and the existing nylon tube bundle together with a new band without cutting the existing band.**

AIR PIPING DIAGRAMS

GKB4DA (Air Suspension)

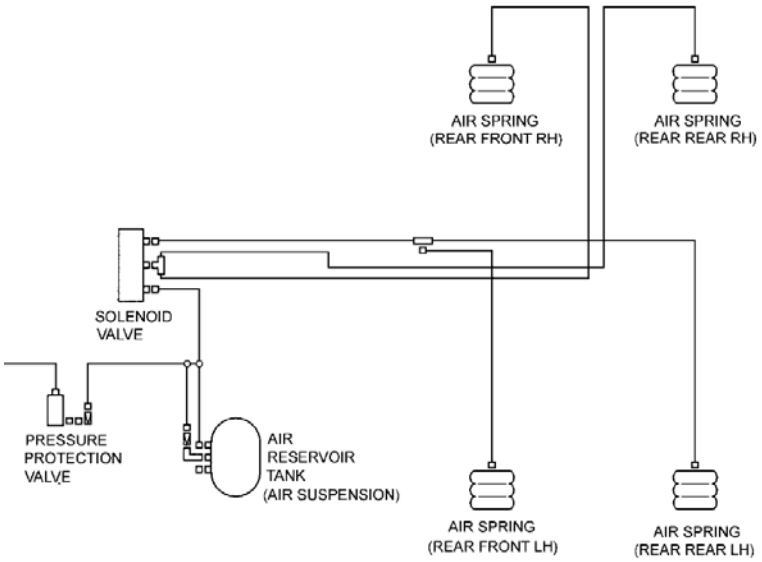


GKB4DA (ESCOT Transmission & Auxiliary Equipment)

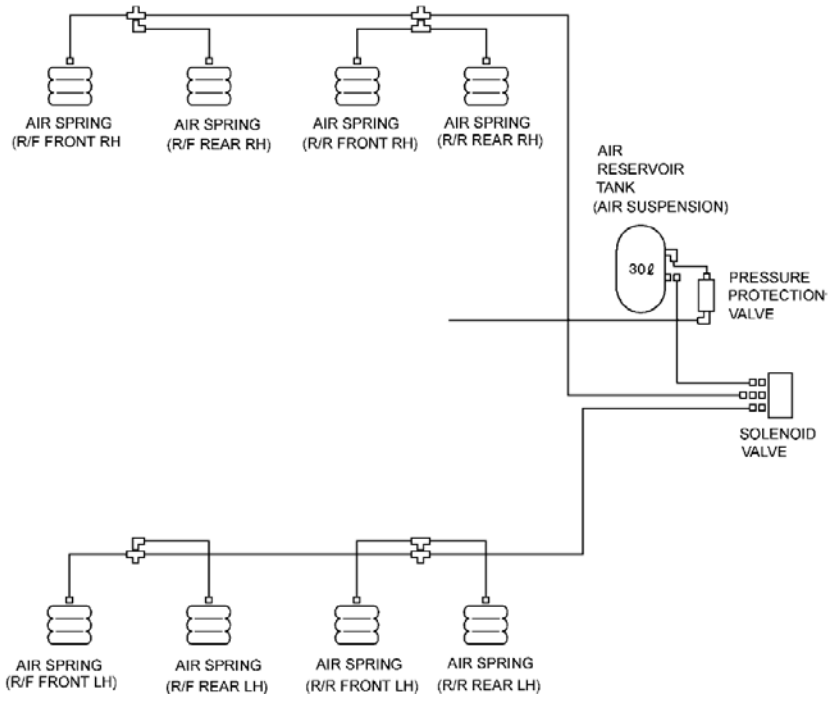


Air Suspension – Full Floating Type

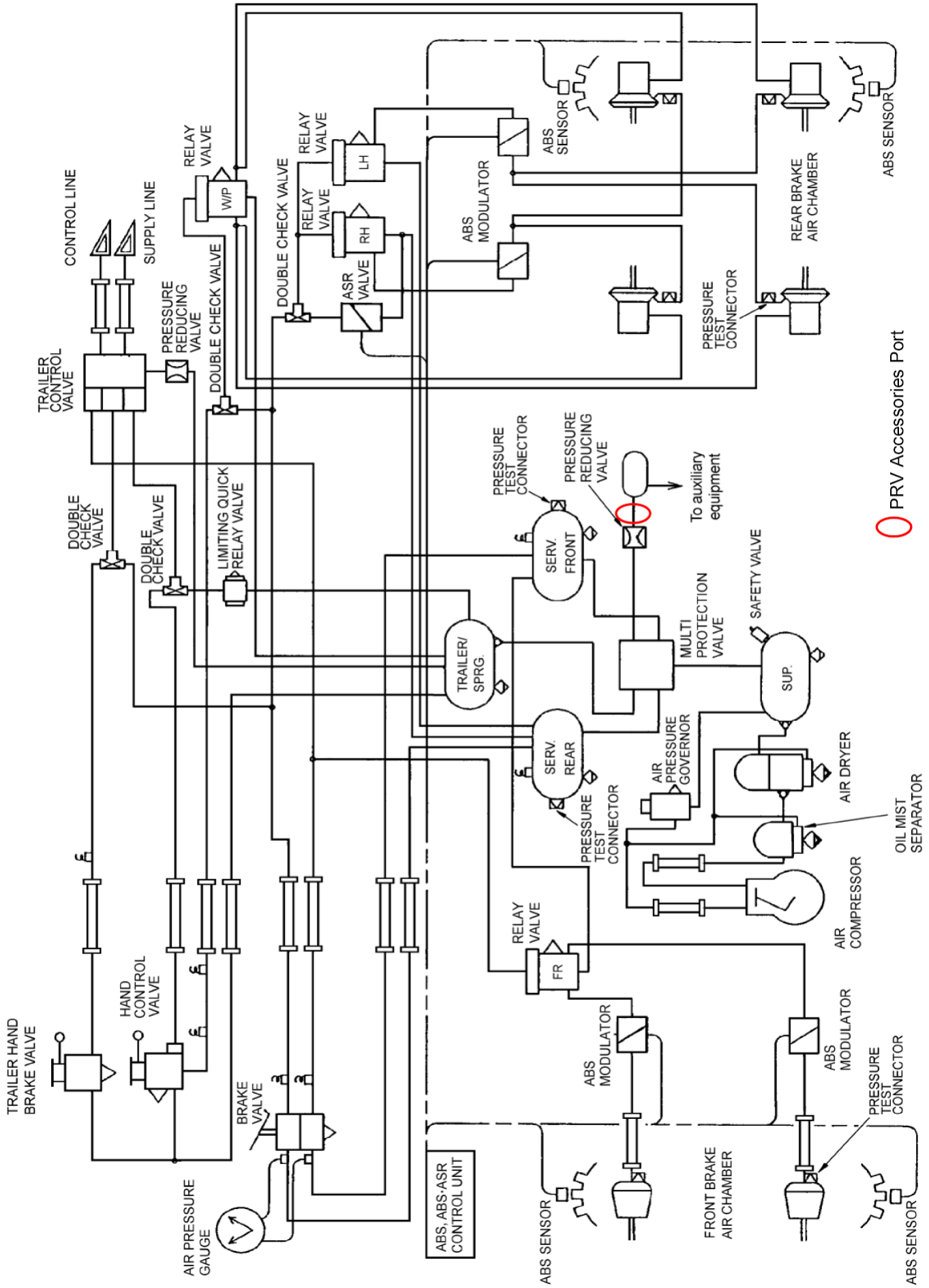
GKB4DA



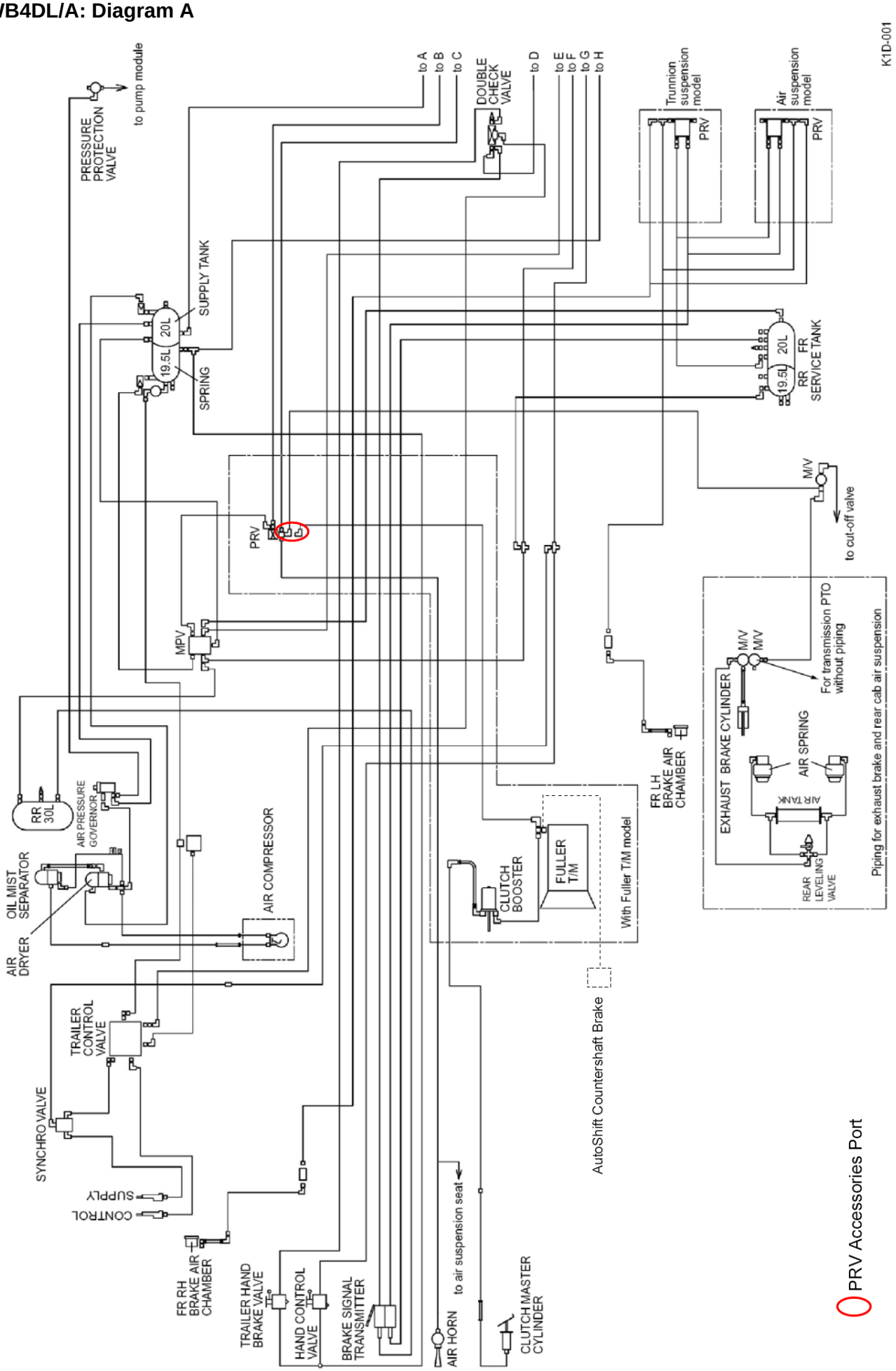
CWB4DA



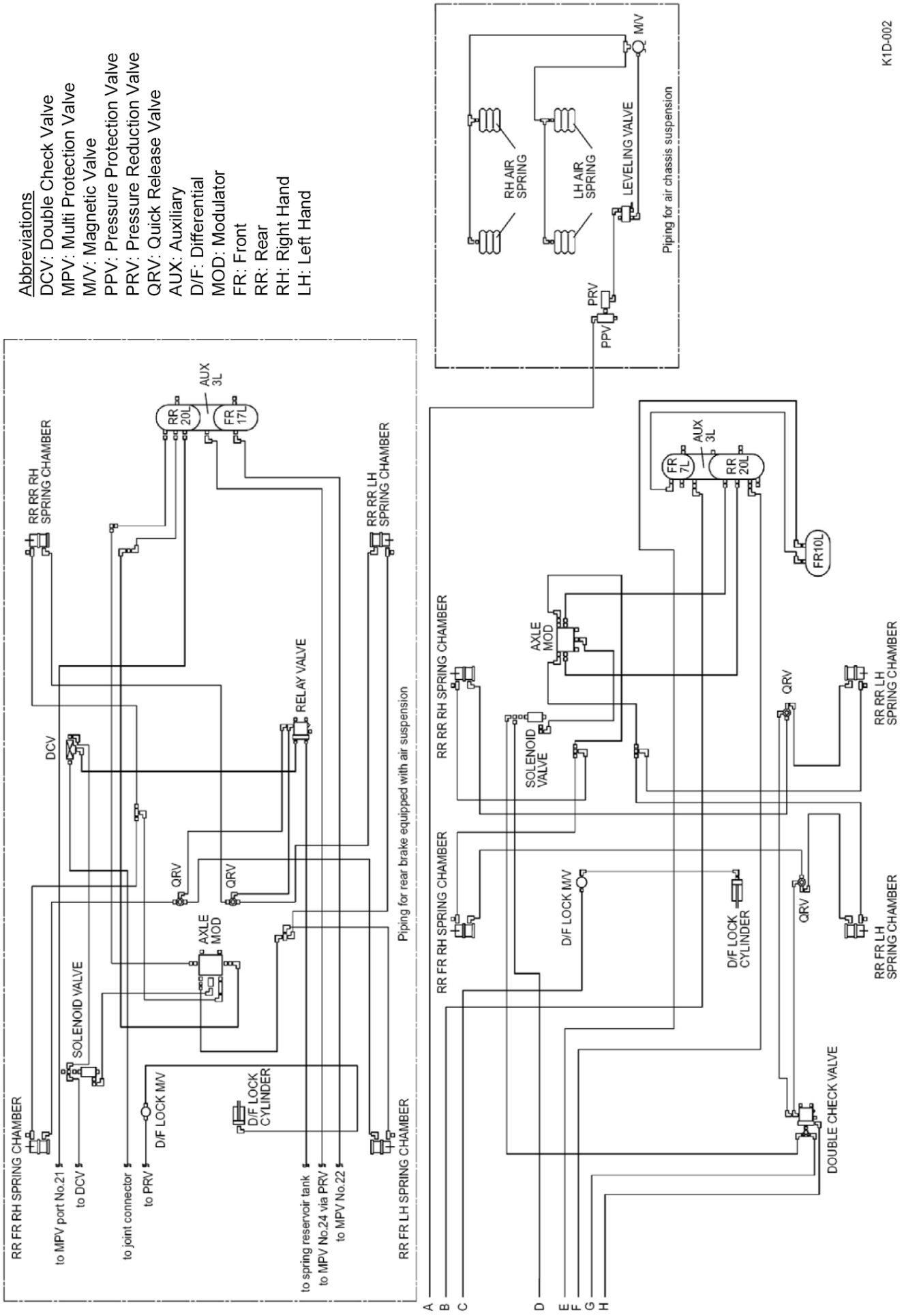
CWB4DA (Air Suspension)



GWB4DL/A: Diagram A



GWB4DL/A: Diagram B



PRECAUTIONS ON PAINTING

Painting of Cabs

Large vehicle cabs are generally over-coated with the painting colour indicated in the table below before shipment.

Paint Colour Code	KANSAI PAINT
	W33
	Jumping White

Optional “factory” paint is available. To identify the paint colour code of vehicles manufactured utilising these optional paint colours contact UDT Parts Dept, phone no. (02) 8711 5570, and quote the vehicle VIN.

Positions of Black-Colour Film attached on Cabs

Black films have already been attached to the cab exterior parts mentioned below. Leave them black, unless otherwise requested by the customer.

If painting is conducted at the customer’s strong request, remove the black film before painting. (Use a commercial seal removal liquid to remove the black film.)

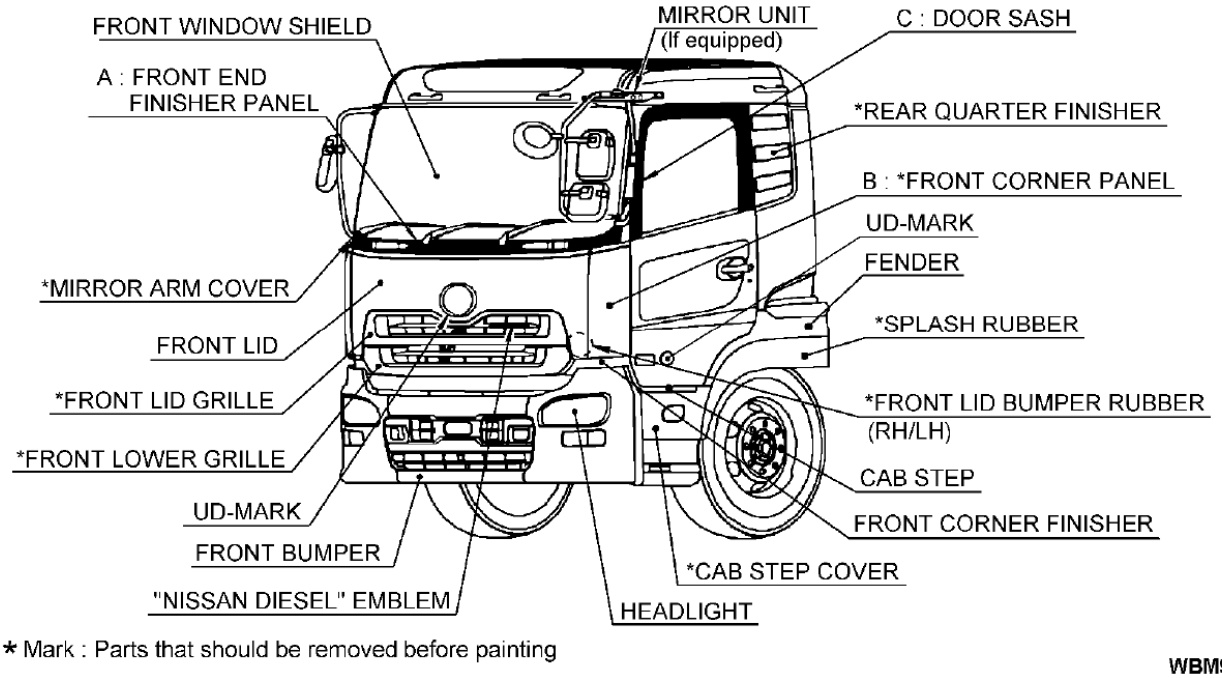
Precautions for handling black films:

1. When washing the vehicle at high pressure and air-blowing:
   - Jet high pressure or blow air 1.5m or more away from the surface of the black film.
   - Jet high pressure or blow air to the film edge with the jet angle of 90°.
   - If the jet angle cannot be set to 90°, set the angle within 45°. Do not jet high pressure or air to only one area on the vehicle for over 5 seconds. (It may cause creases or cracks in the film.)

2. When wiping dirt off:
   - Do not wipe with thinner. Use white gasoline or an alcohol based solvent.

Black film attachment portions:

A: Front end finisher panel under the front window shield (including the front grip and wiper)
B: Upper portion of the front corner panel
C: Door sash



Identification of Cab Parts and Black Film Attachments

Parts that should be REMOVED before Painting

To improve the quality of painting, if the portion to be painted is located behind a cab exterior part, remove the part before painting.

Parts that should be removed before painting:

- Front corner panel (right and left)
- Front lid grille
- Front lid bumper rubber (right and left)
- Front lower grille
- Rear quarter window finisher or rear quarter window (right and left)
- Mirror arm cover (right and left)
- Front fender splash rubber (right and left)
- Cab step cover (right and left)
- Cab step

CAUTION: When reinstalling the removed screws, bolts or nuts, be sure to apply brush painting for sealing to prevent rust.

Masking of Parts that MUST not be Painted

Apply masking to the following parts to prevent the paint from being sprayed.

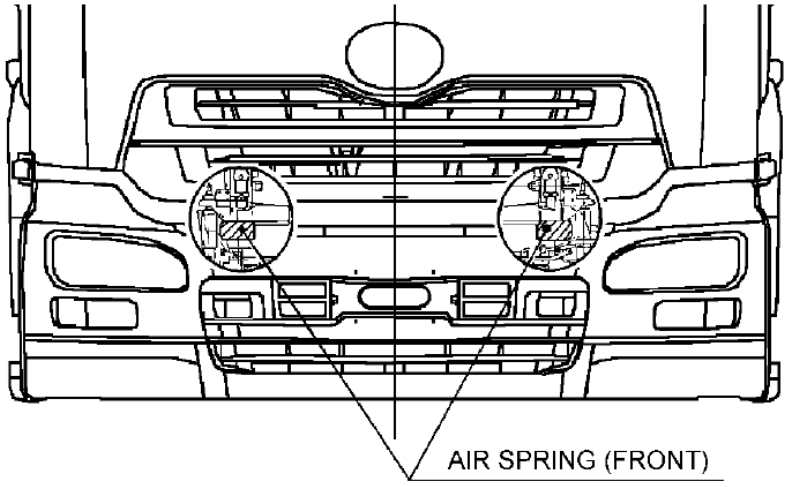
Parts to which masking should be applied:

- Parts where black films have been attached
- Vehicle identification and caution plates and decals
- Hinges and rubber sealing portions around the front lid, glass, weather strips and outer rubber seal
- Lights and their finishers
- Front corner finisher panel of the front lower grille (resin colour)
- Fender step, rear fender
- Door handles and their finishers, interior trimming parts and switches
- Battery and various rubber hoses, harness and wiring connectors
- Water sub-tank and power steering oil reservoir
- Piston rod and dust sealing portion for the cab tilt cylinder
- Air spring for cab air suspension
- Roof grip, mirror arm, mirror unit and radio antenna
- Rear quarter window finisher
- Front UD mark and door UD mark

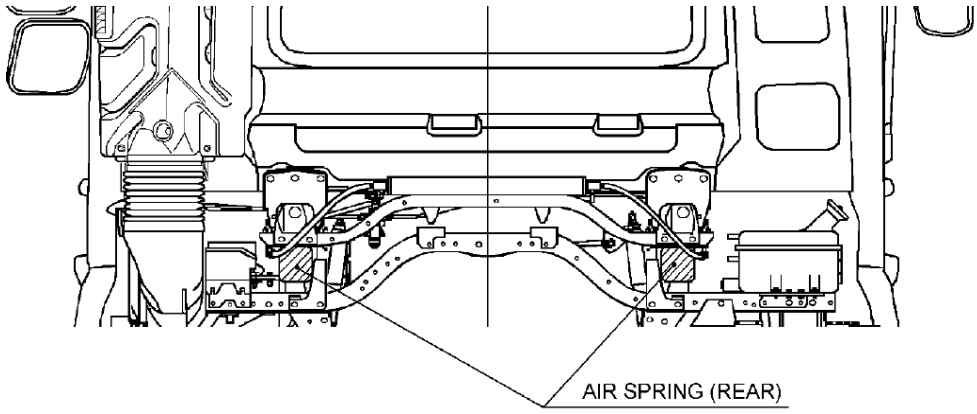
Installation of roof grip, end-outline marker lamps and radio antenna:
The roof grip, end-outline marker lamps and radio antenna should not be painted. Therefore, it is recommended to apply masking to them. If they are removed for painting according to a strong request by the customer, be sure to install a packing to the given position to prevent water leak or rust and tighten the attaching screws to the specified torque.

Precautions on Painting the Air Spring for Cab Air Suspension

If paint is applied to the air spring or the air spring is exposed to high temperature, its durability is significantly reduced. Before painting, be sure to apply masking to the air spring so that it is protected from paint.
If there is a possibility that it is exposed to a high temperature of over 80°C due to drying of paint by heating, apply a heat insulation shield to prevent the exposure to high temperature.
The air spring is not fully resistant to grease, oil, paint, etc. Therefore, due care should be taken to protect it from these substances during painting work.



Air Spring – Front Cab Suspension



Air Spring – Rear Cab Suspension

Precautions on Painting Resin (plastic) Parts

If resin parts are painted according to a strong request by the customer, strictly observe the following precautions.

1. Before painting, remove dirt from the surface of resin parts to be painted and remove grease carefully. If resin parts are sandpapered to improve the quality of painting, use a fine-grained sandpaper of #400 or upper number finishing with a very fine-grained sandpaper of #1000 or upper number. Be careful not to bare the resin material or cause a sanding flaw when sandpapering.
2. Should the resin material be exposed, apply a primer for resin to prepare the substrate and then apply top coating.
3. It is recommended to use a general type of paint for resin. Paint for sheet metal, if it is lacquer (acrylic) for cold drying, can be used for overcoat as it is. Wherever possible, however, it is recommended to apply substrate preparation with Surfacer, etc.
4. For the allowable temperature limits during drying of major parts, refer to "Allowable Temperature Limits of Major Parts". Use air-drying at a temperature below 80°C in any case. Baking finish is strictly prohibited. When a heat lamp is used for promoting drying, be careful not to concentrate excessive heat to one point and not to increase the temperature of any point to over 80°C.
5. When 2-component paint (urethane, etc.) with hardener is used, be sure to apply the paint for a trial to the back side or inconspicuous portion of the resin part to be painted and check that there is no problem with the resin and finished colour before painting.

CAUTION: The front UD top mark is resin plated. Avoid painting on it. If painting on the front UD top mark is strongly requested by the customer, scrape off the resin plating, apply a primer for resin, and then apply overcoat.

Precautions for Resin Parts that shouldn't be Painted (polypropylene resin)

Unlike general resin parts, the overcoat of the following resin parts (polypropylene) will result in poor adhesion and paint is likely to flake off. If the resin parts are painted according to a request by the customer, strictly observe the following precautions.

Polypropylene resin parts:

- Right and left mirror housings
- Mirror unit
- Rear fender
- Mud guard
- Air intake duct
- Fender step

1. Apply a primer for polypropylene before over-coating. This type of primer is called "P.P Primer" and available on the market. Inquire to the paint manufacturer for detailed specifications.
2. Before applying a primer for resin, remove grease fully and make sure that the degreasing agent is completely dry. If silicon-off or thinner is used for degreasing, it penetrates and stays in the resin. If the degreasing agent remains in the resin, the primer may flake off. Air dry the degreasing agent at a temperature under 80°C.
3. Use paint for overcoat that can be air dried at a temperature less than 80°C.
4. General paint for resin can be used for overcoat without any problem. Some paints using a 2 component hardener, however, are incompatible with resin. Inquire to the paint manufacturer for details.

Attachment of Decals

If decals are attached at the customer's request, use a specified cutting sheet vinyl for automobile exteriors. Just as with painting, remove grease fully from the attachment surface before attaching decals.

ALLOWABLE TEMPERATURE LIMITS OF MAJOR PARTS

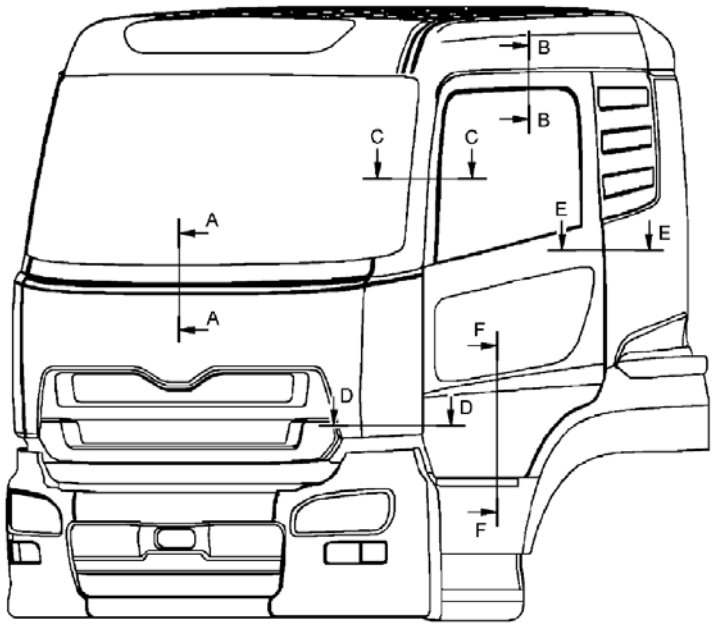
No special care is needed for air drying of painting, but in the case of forced drying, keep the atmosphere temperature on the painted surface under 80°C.
If the temperature unavoidably exceeds 80°C, refer to the Table for Allowable Temperature Limits of Major Parts below and take appropriate measures such as removal of the part according to the conditions.

Category	Major Parts Names	Portion	Material	Limit Temp. °C
Cab electrical parts	Headlamp	Housing	Polypropylene	80
	Front turn signal lamp	Lens, Housing	Acrylic, Polypropylene	80, 80
	Door side turn signal lamp	Lens, Housing	Acrylic, Polypropylene	80, 80
	Wiper blade	Blade	Rubber	80
	Wiper link	Shaft cover	Polyvinyl chloride	80
	Radio antenna	Mounting base	Polypropylene	80
Exterior parts around the cab	Front windscreen	Body	Laminated glass	120
	Mirror	Housing	AAS resin	80
	Mirror unit, right mirror cover	Body, Cover	Polypropylene	80
	Roof grip	Body	AES resin	80
	Rear quarter window finisher	Body	AES resin	80
	Corner panel	Body	AAS resin	80
	Front lid grille	Body	AAS resin	80
	Front lid grille (plated product)	Body	ABS resin	80
	Front lower grille	Body	AAS resin	80
	Front lower grille (plated product)	Body	ABS resin	80
	Front bumper grille	Body	AES resin	80
	Air dam skirt	Body	AES resin	80
	Bumper step	Body	Polypropylene	80
	Corner finisher	Body	Polypropylene	80
	Fender step	Body	Polypropylene	80
	Fender	Body	PPO+PA	150
	Drip seal rubber	-	Rubber	100
	Step cover	-	PPO+PA	150
	Slash rubber	-	TPK	80
	Door handle finisher	Body	AES resin	80
	Front bumper side	-	Polypropylene	80
	Air intake duct	-	Polypropylene	80
	Air spring for cab suspension	-	Rubber	80
	Rear fender	-	Glass fibre reinforced polypropylene	120
	Mudguard	-	Polyethylene	110
	Clutch reservoir tank	Tank, Cap	Polypropylene	80
Cab interior parts	Moulded ceiling	Surface film	Polyvinyl chloride + Polyethylene foam	80
	Sun visor	Surface film	Polyvinyl chloride + Urethane	80
	Back finisher	Surface film	Polyvinyl chloride	80
	Heater and cooler units	Body cover, Filter	Polypropylene	80
	Caution and warning labels	Adhesive	-	80
Chassis electrical parts	Rear combination lamp	Lens, Housing	Acrylic, Polypropylene	90, 80
	Reverse lamp	Lens, Housing	Acrylic, Polypropylene	90, 80
	Registration plate lamp	Lens, Housing	Polycarbonate, Polypropylene	140, 80
	Battery and battery cover	Battery case, Cover	Polypropylene	80
	Battery switch box	Body	Polypropylene	80
	Relay box	Body	Polypropylene	80
	Harness	Coating	Polyvinyl chloride	80
	Wires and cables	Coating	Polypropylene	80
Parts around chassis	Fuel tank	Content	Light oil	100
	Fuel tank gauge unit	-	-	80
	Fuel hose	-	Rubber	100
	Grease	-	-	60
	Radiator hose	-	Rubber (EDPM)	120
	Water sub-tank	Body	Polypropylene	80
	Heater hose	-	Rubber	100
	Power steering reservoir	-	Nylon 6	120
	Power steering hose	-	Rubber	120
	Brake hose	-	Rubber	120
	Air piping nylon tube	-	Nylon	100
	Tyre	-	Rubber	100
	AdBlue tank	Content	Urea water solution	80
	AdBlue tank level sensor	-	-	80
	AdBlue tank quality sensor	-	-	80
	AdBlue tank water supply inlet cap	Body, Packing	Polyamide 12, Rubber (EDPM)	145, 120
	Transmission control cable	Surface film	Polypropylene, Polyvinyl chloride	120, 80
	Step cover	-	PPO/PA	150

Table for Allowable Temperature Limits of Major Parts

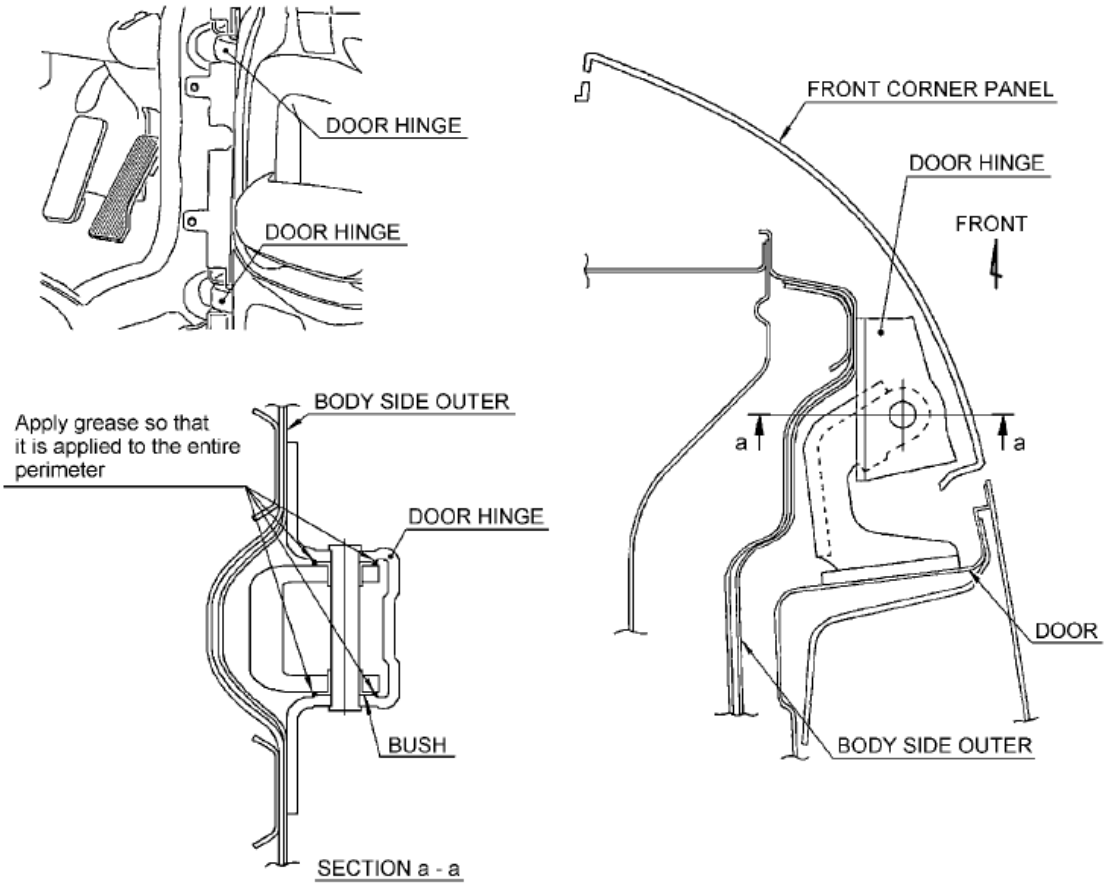
BOUNDARIES OF CAB PAINTING

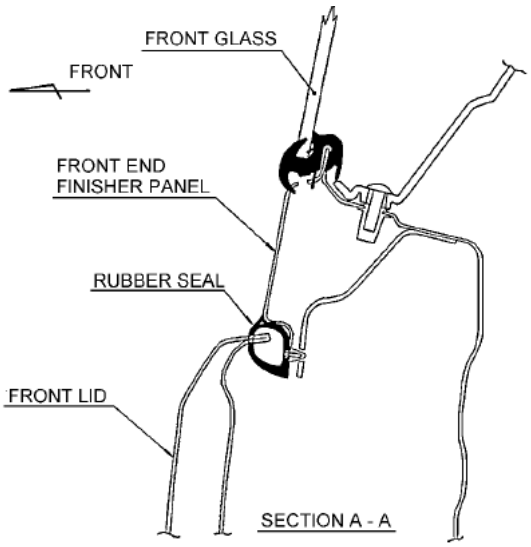
Primer and undercoat coating has already been applied to the outer panels of the whole cab to prevent corrosion. Therefore, when repainting the cab refer to the “Boundaries of cab painting” below for suggested “visible” areas/boundaries for overcoat (top coat).

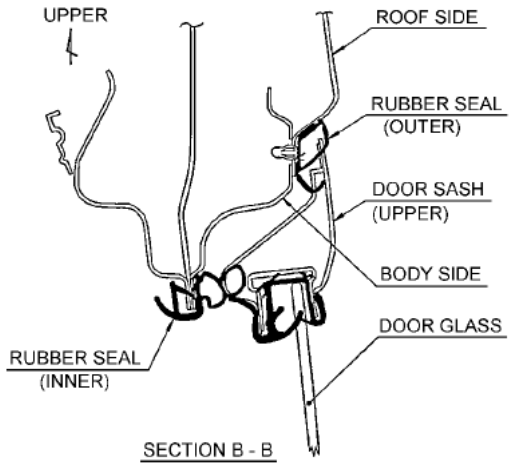


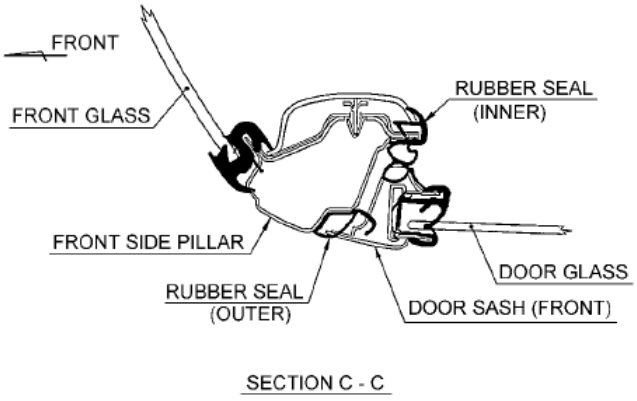
Boundaries of Cab Painting

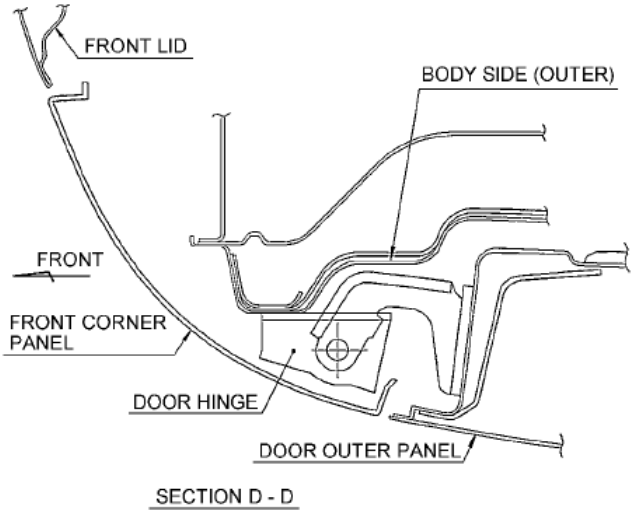
CAUTION 1: If the door hinge is painted, apply grease to the hinge rotating portion. (Apply all around the rotating portion of the hinge bush.)











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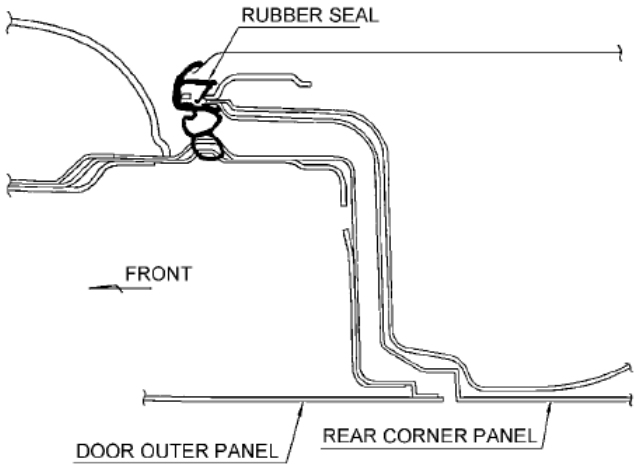

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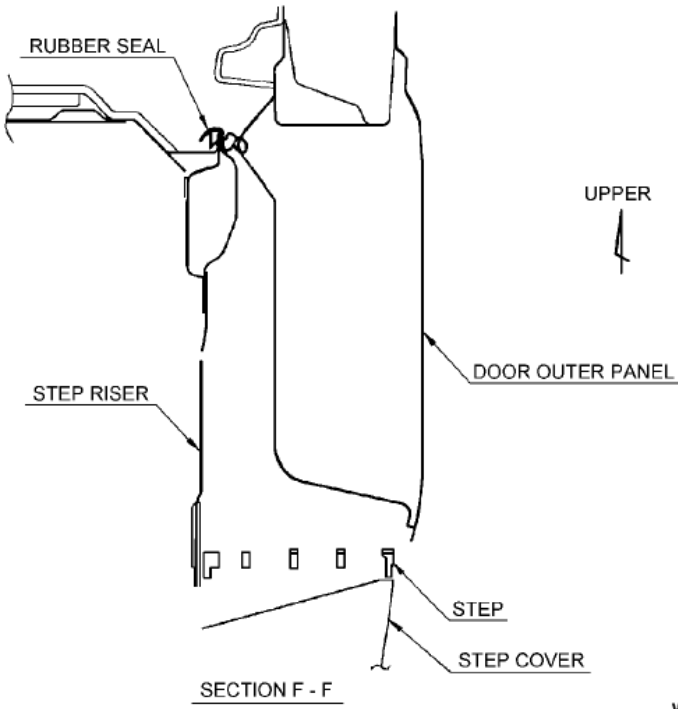
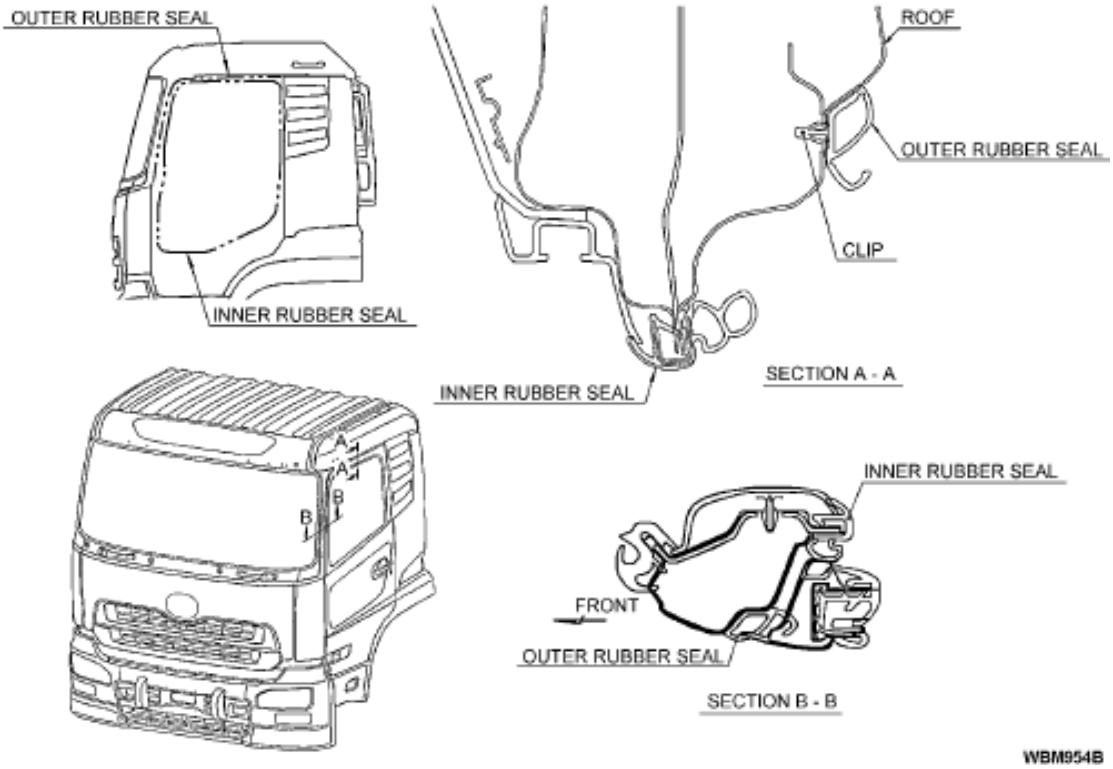
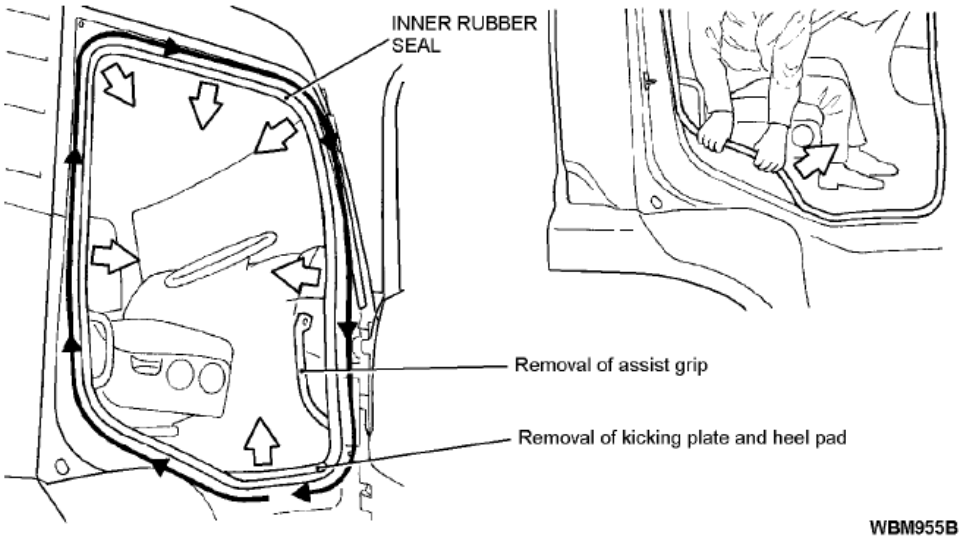


CAUTION 2: **Precautions on painting rubber portions**

- **Before applying overcoat to the cab, mask the outer rubber seals.**



1. Removal of inner rubber seal
   1) Remove the assist grip, kicking plate and heel pad.
   2) Remove the inner rubber seal from the lower part of the opening toward the upper part. At that time, pull it out in a direction perpendicular to the opening end.



- When removing, do not pull it downward as shown in Fig. 1.
  (The cross section of the inner rubber seal may be deformed, resulting in degradation in retention.)

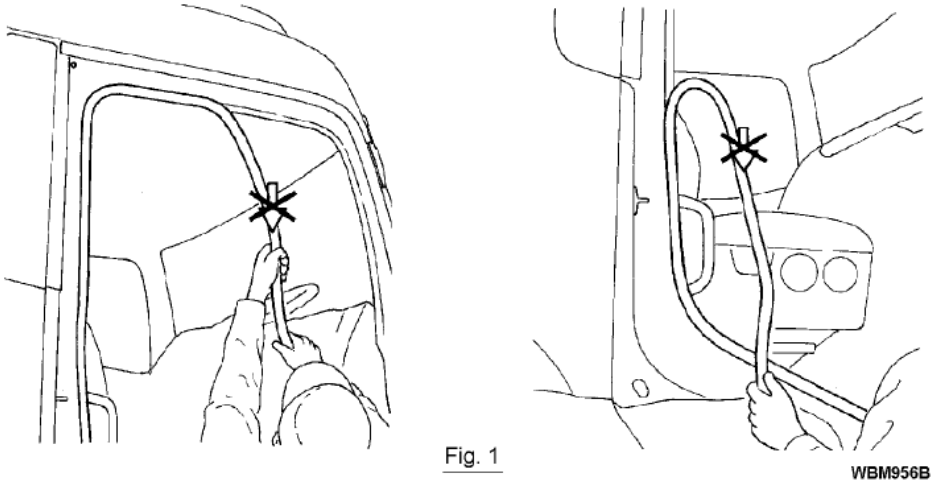


Fig. 1

- After removal, if it turned out that the cross section is deformed and the dimension A as shown in Fig. 2 exceeds 8.0mm, adjust the dimension A to 8.0mm or less before assembly.

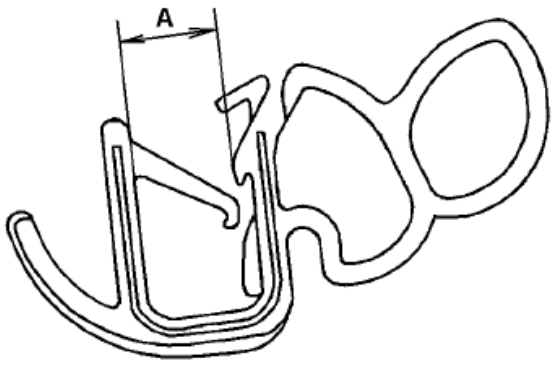


Fig. 2

2. Installation of inner rubber seal
   1) The inner rubber seal has 2 notches. Install it so that the water drain holes (two) between the notches face the floor side. (Fig. 1)

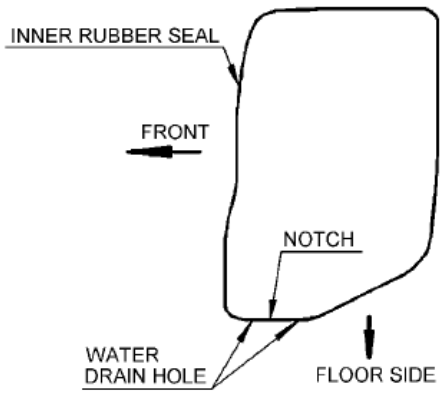


Fig. 1

   2) Completely insert it into the panel flange across the protrusion in the inner rubber seal so that the gap between the panel and the seal becomes 1mm or less (Fig. 2).
   After installation, check that the intermediate portion with the mark ***** (Fig. 3) of the inner rubber seal is in contact with the door sash. (If the intermediate portion with the mark * is not in contact with the door sash, the inner rubber seal has not pressed in sufficiently. Press in further.)

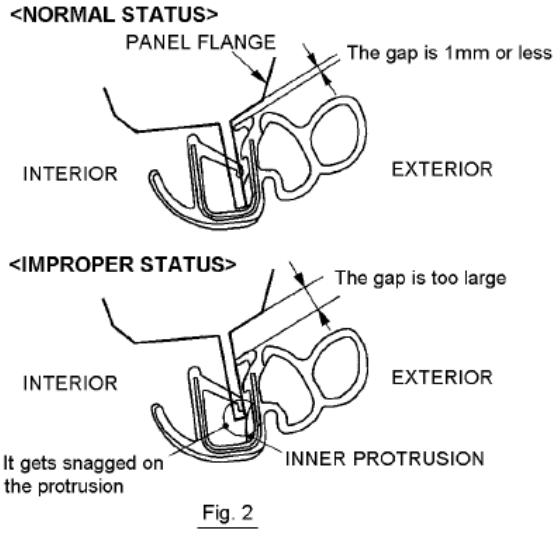


Fig. 2

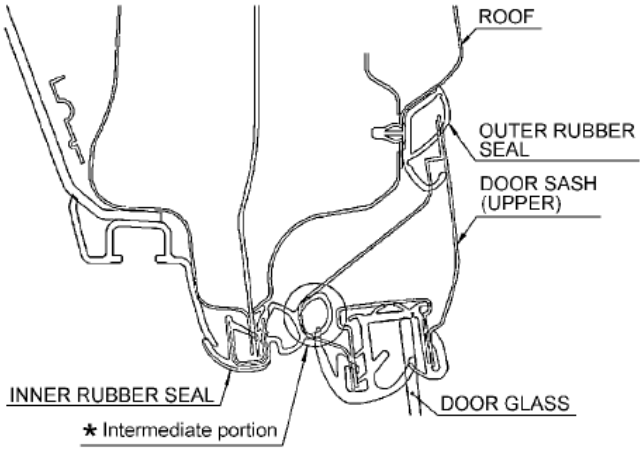


Fig. 3

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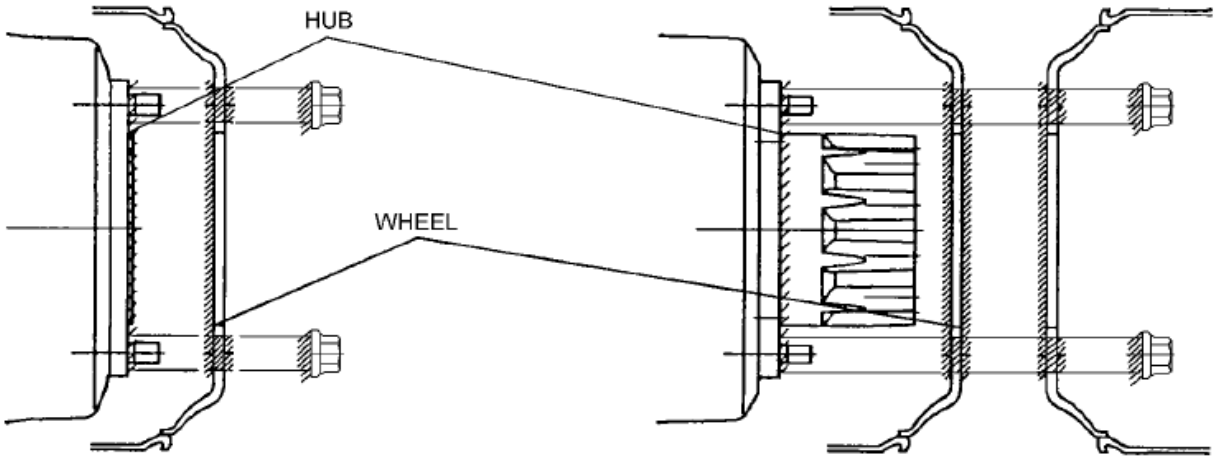
PRECAUTIONS ON PAINTING THE DISC WHEEL

1. Additional painting is prohibited in the shaded areas.
2. Additional painting to the wheel should be conducted from the outside after installation of the wheels on the vehicle and after tightening of the wheel nuts.
   Refer the NMDC Service Manual or the vehicle Owner's Manual for the specified tightening torque.
3. Alternatively mask all shaded areas before painting.



Portions where additional painting is prohibited

HUB : Disc wheel installation face

Wheel : Installation face to the hub
Matching surface of double tires
Bearing surface of wheel nut (flat surface)

RHS of Chassis Air Tank Relocation – GWB4D: Installation of Spare Wheel/Tyre Assembly

GW400 and GW470 vehicles ordered with a single fuel tank will be fitted with a spare tyre carrier mounted to the RHS of the chassis frame and the spare tyre strapped to the rear of the chassis. Due to the mounting positions of the vehicle air tanks, it is not possible to mount the spare wheel to the carrier. In order to fit the spare tyre, UD Trucks have developed a relocation kit for both GW400 and GW470 models with either Air bag or Leaf spring rear suspension. The kit relocates the RH air tank, originally located under the chassis rail to above the carrier assembly.
Dealers are able to purchase this kit though the UD Trucks Parts department. Part No: 99999-ATR01

For more information please contact your UD Trucks, Regional Sales Manager.

Figure 1

The Spare wheel/tyre fitment is a dealer fit option. Please refer to the GW spec sheet.

Issued Date: May 2010

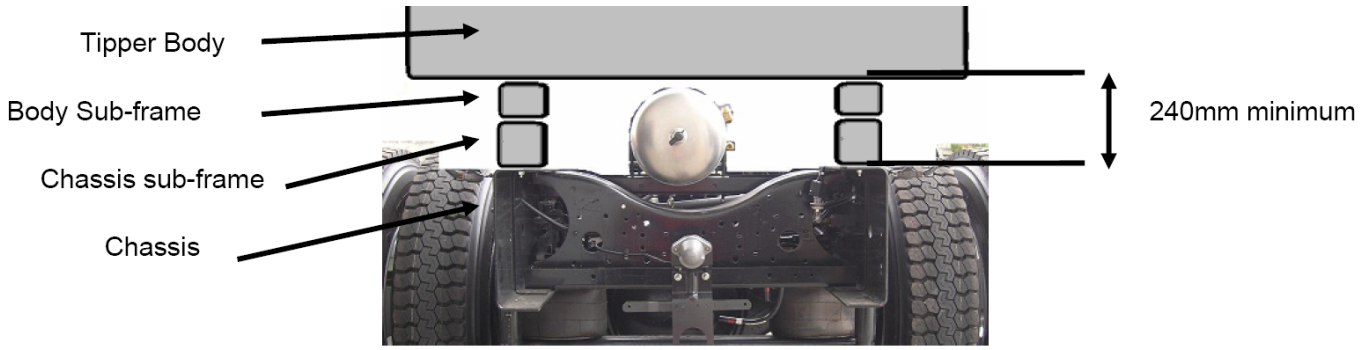
ROF Air Tank Relocation – GWB4D: Air Rear Suspension Models for Tipper Application

GW400 and GW470 vehicles with Air Bag rear suspension that are to used in a tipper application and require a towing attachment will require the rear air tank to be relocated. In order to do this UD Trucks have developed a relocation kit for both GW400 and GW470 models with Air bag rear suspension. The kit relocates the rear mounted air tank, originally located transversely under the chassis rails behind the rear axle, to longitudinally above the rear axle and between the chassis rails (see below). At this stage this modification is only suitable for tipper bodies with large cross section sub-frames (i.e. Aluminium tipper bodies) as it has a minimum chassis to body clearance of 240mm. An updated kit, with a lower profile air tank location will be available in the coming months. This will be more suitable for tipper bodies with a smaller sub-frame size (i.e. steel tipper bodies).

Dealers are able to purchase this kit though the UD Trucks Parts department. Part No: 99999-ATR02

For more information please contact your UD Trucks, Regional Sales Manager.

Figure 1



Rear Chassis Dock – GWB4DA: Prime Mover Application

To Be Provided